The Scientific Review,
AND
SCIENTIFIC AND LITERARY REVIEW,
A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
REGISTERED FOR TRANSMISSION ABROAD.] Journal of the Inventors' Institute. [ALL RIGHTS RESERVED.

VOL. XVII.—NO. 9.] SEPTEMBER 1, 1882. [PRICE 6d.

SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

July 21st to August 20th inclusive.

The following Index gives first the class, then the name of the Inventor, and No. of the application. In this list (com.) means Invention communicated from abroad. Further information as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur Street, Charing-cross.

ACIDS.—S. Pitt (com.), 3714. E. A. Brydges (com.), 3789.

AERATED Liquids, Mineral Waters, Aerating, &c.—J. and R. Alabaster and J. E. Simms, 3483.

AIR, Gas and Wind Engines, and Mills, Pneumatic Motive Power.—J. Hargreaves, 3540. E. E. H. Rousseau, 3762. H. Davey, 3787. J. McGillivray, 3819.

AIR, Gases, and Vapours (Pumping, Forcing, Exhausting, Compressing, &c.)—J. N. Norton and J. Sturgeon, 3484. W. R. Lake (com.), 3551. E. E. H. Roussean, 3762. C. W. Harding, 3827.

ALKALIES (Soda, Potash, Lithia, Ammonia.)—A. J. Boult (com.), 3577. A. Feldmann, 3643. J. Noble, 3784. D. Urquhart, 3977.

ALUMINIUM (Salts), Alumina, Alum, &c.—P. and F. M. Spence, 3835.

AMBULANCE, &c.—H. Hides (com.), 3516.

ASPHALTE, Bitumen, Tar, Pitch, &c.—W. Maxwell, 3640. B. D. Healey, 3783.

AXLES, Shafts, Bearings, Journals, Axle Boxes, &c.—H. Smith and C. Harrison, 3474. H. J. Haddan (com.), 3247. E. J. Sterling, 3527. W. P. Thompson (com.), 3645. W. R. Lake (com.), 3717. J. Mackray, 3887. W. R. Lake (com.), 3903. P. Armington, 3914.

BAGS, Portmanteaus, Sacks, Holders, Satchels, Reticules, Kuapsacks, Valises, &c.—W. H. Chase, 3652.

BANDS, Belts, Straps, Chains, and Ropes for Driving Machinery, Belt Shippers, &c.—W. Hartcliffe, 3605.

BATHS, Bathing Appliances, Lavatories, &c.—H. Darby, 3929.

BELLS, Gongs, Ringing Bells, &c.—J. Harrison, 3699.

BOBBINS, Spools, Reels, Cop-tubes, &c.—E. Hunt (com.), 3765.

BLEACHING, Decolourising, &c.—J. C. Mewburn (com.), 3740. J. Imray (com.), 3773. E. de Pass (com.), 3875. C. Toppan, 3904.

BLOWING Engines, Fans, Bellows, &c.—F. M. Eden, 3686. R. R. Gubbins, 3890.

BOILERS, Coppers, Kiers, &c.—A. Barraclough, 3721.

BOOKS, Albums, Portfolios, Book Covers, Book Cases, Book Slides or Holders, Bookbinding, &c.—C. Q. Basevi, 3530. A. Gerken, 3585. H. J. Allison (com.), 3918.

BOOTS, Shoes, Leggings, Clogs, Cleaning Boots, Boot-jacks, &c.—J. N. Aronson, 3468. G. F. Redfern (com.), 3648. C. E. Bryant, 3738. W. Morgan Brown (com.), 3881. J. Hopewell, 3993.

BORING, Drilling, and Rifling, Gimlets, Augers Drills, Reamers, Boring Bits, Ratchet and other Braces.—J. Brown, 3886. J. Waddington, B. Longbottom and J. Ashworth, 3983.

BOTTLES, Bottle-stoppers, Capsules, Bottling and Decanting Liquids, Stopping and Opening Bottles, &c.—T. and J. Brooke, 3670. H. Shaw, 3732. J. Ferguson, 3854.

BOXES, Cases, Bins, Chests, Trunks, &c.—P. Everitt, 3567. W. R. Lake (com.), 3586. P. Jensen (com.), 3800. A. J. Boult (com.), 3850. E. P. Alexander (com.), 3966.

BREAD, Biscuits, &c.—J. R. Chibnall, 3913.

BREAKS for Machinery, Stop Motions, &c.—H. Fisher and J. S. Walker, 3581. H. J. Haddan (com.), 3627. H. J. Haddan (com.), 3629.

BREAKS for Railways, Tram Cars, and Road Carriages, &c.—J. M. Hanne, 3475. G. E. Vaughan (com.), 3622. S. Williams, 3674. J. Gresham, 3704. S. Carlton, 3806.

BREWING, Treating Malt, and Malt Liquors.—A. Barraclough, 3721. L. Varicas (com,), 3896.

BRICKS, Tiles, and Building Blocks, &c.—A. Bouquie, 3741. J. C. Bloomfield and J. McGurn, 3775.

BRIDGES.—Arches, Viaducts, Aqueducts.—A. Williams, 3925.

BRUSHES, Brooms, Mops.—A. J. Boult (com.), 3837.

BUILDING, Flooring and Roofing, Walls, and Ceilings, &c.—A. M. Clark (com.), 3749. E. A. Brydges (com.), 3844. S. Fisher, 3921. S. Cornforth, 3965. J. Chaffin, 3969.

BUTTER, &c.—H. J. Haddan (com.), 3892.

BUTTONS, Studs, Sleeve Links, and other Dress Fasteners, Eyelets, Button Holes, Solitaires, &c.—J. N. Aronson, 3468. C. Daggett, 3603. G. F. Redfern (com.), 3648. A. B. Furlong 3720. A. Combault and W. T. Taylor, 3722. W. G. Rigden, 3845. J. E. Walsh (com.), 3860.

CANS, Canisters, Tins, Drums, &c.—A. J. Boult (com.), 3850.

CARRIAGES, Cabs, Omnibuses, Waggons, Carts, Trucks, Perambulators, Barrows, Loading, Unloading, and Tipping Carts, &c.—C. Court, 3493. E. M. Desprez, 3496. E. D. Greening and H. J. Collins, 3506. H. J. Haddan (com.), 3559. E. Hollingworth, 3694. U. Scott, 3728. A. J. Boult (com.), 3838.

CARTRIDGES, Cases and Holders, Percussion Caps, &c.—C. S. Bailey, 3625.

CASKS and Barrels, Cask-stands, Vent-pegs, Tilting Casks, &c.—S. Wright, 3589.

CASTING and Moulding, Plastic Compositions, &c.—B. J. B. Mills (com.), 3737. J. A. B. Bennett and B. P. Walker, 3958.

CELLULOID, &c.—J. H. Gartrell, 3750.

CEMENT, Plaster, Mortar, and Concrete Cements.—N. Roth, 3702.

CENTRIFUGAL Machines.—J. H. Johnson (com.), 3505.

CHAINS, Chain Cables, Shackles, Links, Swivels, &c.—J. H. Shoebotham and J. T. C. James, 3495. W. Hartcliffe, 3605. J. Walker, 3612. A. M. Clark (com.), 3967.

CHARCOAL, Coke, Carbon, Lamp-black, Plumbago, &c.—J. Wood, 3776.

CHEMICAL Compounds, Vessels, Apparatus, Manufactures and Processes (miscellaneous), &c.—J. W. Kynaston, 3809.

CHURNS, Making Butter, &c.—M. Causland, 3973.

CISTERNS, Water Tanks, Reservoirs, Vats, &c.—W. Wright, 3511.

CLOCKS, Watches, Chronometers and other Timekeepers, Watch Keys, &c.—W. R. Lake (com.), 3572. W. M. Brown (com.), 3804.

CLUTCHES and CLUTCH BOXES, &c.—E. J. Stirling, 3527. H. Fisher and J. S, Walker, 3581.

COATING, Covering, Plating, Sheathing, Gilding, Bronzing, &c.—A. J. Boult (com.), 3498.

COFFINS, Embalming, &c.—S. J. and R. Turner, 3919.

COLUMNS, Pillars, Pedestals, Posts, &c.—W. A. Barlow (com.), 3798.

CONVEYERS, &c.—L. E. Mansfield, 3734.

COPYING, Tracing, Drawing, Writing, Ruling Paper, &c.—T. H. Taylor, 3726.

CUTTING, Sawing, Planing, and Carving, &c.—J. Rowley and H. Vulliamy, 3490. W. P. Thompson (com.), 3537. A. M. Clark (com.), 3654. T. Clark, 3823. E. Dredge, 3836. W. R. Lake (com.), 3899. A. T. Graham and A. Frost, 3935.

CYLINDERS and Rollers, Covering Cylinders and Rollers.—A. J. Boult (com.), 3509. W. R. Lake (com.), 3888. B. J. B. Mills (com.), 3962.

DENTISTRY, Artificial Teeth, Tooth Powders, &c.—J. H. Gartrell, 3750.

DISINFECTING, Deodorising, Fumigating Apparatus and Compositions, &c.—R. Nicholls, 3863. C. Lowe and J. Gill, 3917.

DISTILLING and Rectifying.—H. A. Bonneville (com.), 3489. W. Maxwell, 3640. G. F. Redfern (com.), 3646. J. Wood, 3776. A. Brydges (com.), 3789. E. K. Mitting, 3792.

DOORS, Gates, and Door Furniture.—T. Marlborough and G. Cunningham, 3664. W. P. Thompson (com.), 3676. W. Thomson, 3688. E. E. H. Roussean, 3762. H. J. Haddan, (com.), 3817. G. J. Dickson, 3959.

DRAINS, Sewers, Gutters, Gratings, Gulleys, Ditches, Traps, Sinks, &c.—A. Bouquie, 3741. T. S. Wilson and H. T. Johnson, 3829.

DRYING or Desiccating, Expelling Moistures, &c.—J. H. Johnson (com.), 3505. W. M. Riddell, 3830. T. Bust, 3945.

DRESSES, &c.—C. E. Bryant, 3738. W. R. Lake (com.), 3841.

DYES, and Printing Colours, Dyeing and Staining, &c.—J. Erskine (com.), 3511. W. J. S. Grawitz, 3626. F. Wirth (com.), 3724. D. Guille, 3744. G. Heywood and S. Spencer, 3746. E. de Pass (com.), 3875. C. Toppan, 3905. J. H. Johnson (com.), 3956.

EARTHENWARE and Porcelain, Ceramic Wares, Terra-cotta, &c.—H. H. Lake (com.), 3013. J. Lovering, 3102. J. Brindley, 33[illegible]. J. Gillespie, 3477.

ELECTRICITY, Galvanism, and Magnetism, and their Application.—J. H. Johnson (com.), 3464 L. H. M. Lonzel, 3465. C. A. C. Wilson, 3466. A. Reckenzaim, 3473. W. A. Barlow (com.), 3476. A. d'Oreli, 3504. C. E. Buell, 3528. G. L. Winch, 3532. C. W. F. Hill, 3534. W. Laing, 3544. J. G. Lorrain, 3547. J. Hopkinson, 3576. L. Campbell, 3582. J. Imray, 3591. F. J. Bolton, 3592. J. R. Rogers 3616. T. Cuttriss, 3665. P. R. de F. d'Humy, 2666. W. R. Lake (com.), 3685. W. R. Lake (com.), 3689. G. M. Edwards, 3691. E. G. Brewer (com.), 3700. S. C. Currie, 3712. T. J. Handford (com.), 3753. C. E. Sibley, 3753. T. J. Handford (com.), 3756. E. E. H. Rousseau, 3762. L. Epstein, 3770. C. T. Kingzett, 3802. J. S. Beeman, W. Taylor and F. King, 3813. F. Mori, 3822. A. M. Clark (com.), 3844. C. W. Harding, 3827. W. S. Smith, 3846. J. R. Wells (com.), 3881. J. R. Wells (com.), 3882. H. J. Haddan (com.), 3893. P. Adie and W. S. Simpson, 3912. W. C. Cookson, 3941. T. J. Handford (com.), 3949. S. J. de Ferranti and A. Thompson, 3950. S. S. Allin, 3951. T. J. Handford (com.), 3961. H. T. Barnett, 3904. C. J. Allport and R. Punshon, 3971. J. E. T. Woods, 3975. J. H. Johnson (com.) 3980.

ELECTRIC Light.—A. Reckenzaun, 3473. A. M. Clark (com.), 3508. A. P. Trotter, 3515. A. L. Lineff, 3520. G. M. Newton, 3570. J. G. Lorrain, 3575. W. T. Henley 3583. J. Verity, 3619. O. G. Pritchard, 3655. W. R. Lake (com.), 3689. J. L. Sornoff, 3705. T. Parker and P. B. Elwell, 3710. E. G. Brewer (com.), 3713. T. J. Handford, 3752. J. E. Sibley,

BRITISH MUSEUM

3753. R. Werdermann, 3757. B. Mills (com.), 3779. W. R. Lake (com.), 3795. H. J. Haddan, (com.), 3814. F. Mori, 3821. A. M. Clark (com.), 3824. H. Wilde, 3834. W. R. Lake (com.), 3856. G. Pfannkusche and A. A. Dixon, 3861. F. R. Willes (com.), 3851. W. R. Lake (com.), 3906. T. J. Handford (com.), 3955. T. J. Handford com.), 3991.

ELECTRO-MAGNETIC Engines, &c.—J. Barlow, 3510. D. W. F. Hill, 3534. J. Imray, 3591. S. H. Emmens, 3825. E. Desfosses., 3869.

ENVELOPES (Postal).—G. W. Simmons, 3867.

EXCAVATING and Dredging, Embankments and Tunnels, &c.—W. E. Gedge (com.), 3519. J. T. Jones and Wild, 3598. J. H. Johnson (com.), 3839. H. C. Lobnitz, 3953.

EXPLOSIVE Compounds, Nitro-cellulose, Pyroxyline, &c.—W. J. Reeve, 3479.

FABRICS, Elastic Fabrics, &c.—A. J. Boult (com.). 3498. J. Jouritt and G. S. Page, 3539. A. M. Clark (com.) 3749. E. A. Brydges (com.), 3844. S. Fisher, 3921. W. Astrop and R. Ridgeway, 3932.

FELT, Felted Fabrics, Fulling, Milling, &c.—S. Taylor, 3883.

FIBRES (Obtaining and Treating).—O. Imray (com.), 3602. W. P. Thompson (com.), 3675. H. J. Haddan (com.), 3704. E. de Pass (com.), 3875. P. J. Friedrichs (com.), 3954.

FILES and Clips, Paper Fasteners.—C. Q. Basevi, 3530.

FILES and Rasps, &c.—A. M. Clark (com.), 3654.

FILTERS; Filtering, Purifying, and Clarifying Liquids, Distilling Water, Softening Water.—G. W. von Nawrocki (com.), 3601. A. Stevenson, 3638. L. A. Groth (com.), 3678.

FINISHING and Dressing Woven Fabrics, Yarns, and Threads, &c.—W. W. Blackett, 3569. W. M. Reddell, 3830. C. Toppan, 3905.

FIRE-ARMS, Guns, Ordnance, Gun Carriages, Targets, Rifle Practice.—W. A. Barlow (com.), 3549. W. R. Lake (com.), 3684. A. C. Kirk 3766. J. Imray (com.), 3774. P. Jensen (com.), 3777. W. Rogers, 3877.

FIRE-ENGINES, Extinguishing Fires, &c.—A. M. Clark (com.). 3548. P. M. Justice (com), 3791. J. Kennedy, 3915.

FIRE-ESCAPES, &c.—F. Hoe, 3529. C. S. Beauchamp, 3550. J. Kennedy, 3915.

FIRE-PLACES, Stoves and Ranges, Fenders and Fire-Irons, Fire-Guards, &c.—D. and W. H. Thompson and W. J. Booer, 3523. A. C. Henderson (com.), 3613. H. J. Haddan (com.), 3816. W. J. Henry, 3900. J. F. C. Norman and A. H. P. S. Wortley, 3952. M. M. Bropley, 3960. E. Tomlinson, 3996.

FIRE-PROOFING, &c.—H. Ullamann, 3891. W. Astrop and R. Ridgeway, 3932.

FLUES and Chimneys, &c.—J. Solomon, 3472. E. Edwards (com.), 3487. C. E. Hanewold (com.). 3701. E. Tomlinson, 3990.

FUEL (Artificial), Fire-lighters, &c.—J. Rowley and H. Vulliamy, 8490. T. V. Trew, 3716. E. Tomlinson, 3990.

FURNACES and Fire-boxes, Supplying Furnaces with Fuel.—J. G. Perkins and J. Scott, 3502. A. Beard, 3563. B. Finch, 3564. C. Hill, 3711. W. R. Lake (com.), 3754. J. Noble, 3784. J. Imray (com.), 3786. E. Green, 3794. C. Sinclair, 3809. H. J. Haddan (com.), 3816. W. H. Beck (com.), 3828. B. Ford and J. Moncior, 3897. T. Fletcher, 3923. J. Imray, 3978.

FURNITURE, Bedsteads, Tables, Cabinets, Chairs, Desks, Wardrobes, Upholstery, Cabinet-work, &c.—R. H. Holman and W. Carlton, 3503. O. Seydel, 3597. E. Lawson and E. W. de Rusett, 3624. W. H. Airs, 3719. A. J. Boult (com.), 3729. G. H. Slack, 3747. E. Smith, 3868. W. R. Lake (com.), 3872.

GAMES and Exercises, Billiards and Bagatelle Markers and Indicators for Games, Gymnastic Apparatus.—A. Waddington and J. Rowbotham, 3604.

GARDEN IMPLEMENTS.—J. Alexander and A. T. McCo h, 3610. J. Walker, 3639. W. R. Lake (com.) 3754. J. Noble, 3784. W. S. Sutherland, 3908. S. Holman and C. Hunt, 3938.

GAS and other Burners, &c.—D. and W. S. Thompson and W. H. Booer, 3523. H. W. Hayden, 3623. M. M. Brophy, 3960.

GAS Regulators, &c.—A. Hanley and A. C. Savage, 3611.

GAUGES, Water-level Indicators, Indicating &c.—T. Hughes, 3852.

GLASS (Making and Treating) and its Applications.—H. J. Haddan (com.), 3521. W. S. Sutherland, 3594. J. Markham, 3767.

GLOVES, &c.—J. N. Aronson, 3468. G. F. Redfern (com.), 3648. W. G. Rigden, 3845.

GOVERNORS for Engines and Machinery.—W. R. Lake (com.), 3574. W. R. Lake (com.), 3689. H. Davey, 3785. P. Arnington, 3914.

GRAIN and Seeds (Treating, &c.)—W. R. Lake (com.), 3552. A. W. L. Reddie (com.), 3593. G. W. Murray, 3851.

GREENHOUSES, Hothouses, Conservatories, Forcing Pits, and Frames.—G. Chaffin, 3969.

GRINDING, Crushing, Pulverising and Disintegrating Miscellaneous Substances.—A. W. L. Reddie (com.), 3590. W. R. Lake (com.), 3718. R. J. Cunnack, 3735.

GRINDING and Polishing, Smoothing and Surfacing Emery, Sand, and Glass Papers, Cloths, &c.—J. Robinson, 3543.

GRINDING and SHARPENING, &c.—A. M. Clark (com.), 3654.

GUMS, Resin, &c.—W. Morgan Brown (com.), 3621.

HAMMERS, Hammering, &c.—A. Mure, 3931.

HANDLES, &c.—H. J. Haddan (com.), 3521.

HARBOURS, Breakwaters, Piers, &c.—J. Gordon, 3618.

HARNESS, Saddles, Curbs, Whips, Releasing from Harness, Grooming Horses, Nosebags.—M. McLeod, 3469. A. M. Clark (com.), 3922.

HATS.—J. T. Watson, 3587. R. Walworth, 3596. S. Taylor, 3883.

HEATING, Warming, and Evaporating, Obtaining and Regulating Heat, &c.—D. and W. H. Thompson and W. J. Booer, 3523. B. Finch, 3564. S. R. Smyth, 3607. A. G. Henderson (com.), 3613. H. Gardner (com.), 3693. A. Barraclough, 3721. E. J. C. Fear, 3725. W. and G. Lawrence, 3736. E. E. H. Rousseau, 3762. H. Darby, 3929. M. M. Brophy, 3960. G. H. Blenkinsop, 3972.

HOISTS, Jacks, Lifts, Winches, Cranes, Capstans, Windlasses, Raising, Lowering and Moving Heavy Bodies, Raising from Mines.—J. McAuley, 3499 E. Hollingsworth, 3694. W. R. Lake (com.), 3902.

HORSE Shoes, Shoeing Horses, Shoes for Animals, &c.—F. H. F. Engel (com.), 3620. J. R. Thomson, 3690.

INDEXING, &c.—A. Gerkin, 3585. W. R. Fordham, 3873.

INDIARUBBER, &c.—J. H. Gartrell, 3750. E. Dredge, 3836.

INSCTS and VERMIN (Destroying), &c.—C. Lowe and J. Gill, 3917.

INSULATING, &c.—P. R. de F. d'Humy, 3666. G. W. Edwards, 3691. J. R. Welles (com.), 3881. C. J. Allport and Punshon, 3971. J. H. Johnson (com.), 3980.

IRONING, Smoothing Irons, &c.—H. Podger and W. H. Davey, 3867.

JARS, Jam Pots, &c.—T. and J. Brook, 3670.

JEWELLERY, &c.—J. Lepange, 3680. A. M. Clark (com.), 3967.

KNITTING, Looped Fabrics, Tatting, Crocheting, &c.—A. M. Clark (com,), 3826. W. Harrison, 3968.

KNIVES, Forks, Table Cutlery, Knife Cleaners, &c.—A. Fielding, 3471. D. Hummell (com.), 3801.

LADDERS, &c.—C. A. Jones, 3928.

LAMPS, Lanterns, Chandeliers, Gaseliers, Lamp Furniture, Lighting and Extinguishing Lamps, Artificial Light, Producing Light, Candlesticks, Candelabra, &c.—A. P. Trotter, 3515. A. L. Liberty, 3573. W. L. Wise (com.), 3588. S. R. Smyth, 3607. H. W. Hayden, 3623. C. E. Hanewald, 3701. H. Cullabrue, 3768. W. H. Bulpitt, 3847.

LAY FIGURES, or Dummies.—G. G. Tanner, 3947.

LEATHER, Treating Hides and Skins, Parchment, Currying, Tanning, Cutting, and Ornamenting Leather.—J. H. Johnson (com.), 3483. E. Dredge, 3836. J. H. Johnson (com.), 3880.

LEGGINGS Garters, &c.—G. F. Redfern (com.), 3648.

LIFEBUOYS, &c.—T. W. Brewster, 3512. W. R. Lake (com.), 3872. W. H. Wiliams, 3927.

LIME and its Compounds, Calcium.—J. Imray, 3773. R. Edwards, 3610.

LOCKS, Latches, Bolts, Lock Furniture, Keys, &c.—J. H. Black, 3842. W. Corliss, 3517. H. J. Haddan (com.), 3817. F. Pontifex, 3853. G. J. Dickson, 3959.

LIQUIDS, &c.—H. Gardner, 3693. E. A. Brydges (com.), 3789.

LOOKING Glasses, Mirrors, &c.—H. J. Hinde, 3796.

MANURE; Treating Sewage.—T. H. Cobley, 3497. J. Young, 3562. R. Nicholls, 3862.

MATCHES, Fuzees, Pipe and Cigar Lights, &c.—P. Everitt, 3567. W. R. and J. G. Smith, 3911.

MATHEMATICAL, Surveying, and Astronomical Instruments.—H. J. Haddan (com.), 3546.

MATS, &c.—J. S. Willway, 3793. J. Hopewell, 3993.

MEDICAL TREATMENT of Animals.—C. Lowe and J. Gill, 3917.

MEDICINES, &c.—E. J. C. Fear, 3725.

METAL Waste.—A. T. Becks, 3731.

METALLIC ALLOYS, &c.—C. J. L. Leffler, 3522. J. A. R. Bennett and B. P. Walker, 3958.

METALLIC Salts and Oxides.—J. W. Kynaston, 3809. J. Imray (com.), 3978.

METALS (Annealing, Tempering, &c.).—S. M. and A. Wood, 3805.

METALS (Casting, Moulding, &c.)—J. Riley, 3807.

METALS (Forging), &c.—J. Imray com.), 3561. W. T. Beesley, 3606. E. Deeley, 3673. A. J. Boult (com.), 3850. C. Scriven, 3874. J. Mackay, 3887. A. Muri, 3931. T. Neuray, 3933.

METALS (Smelting, &c.)—C. J. L. Laffler, 3522. J. Gjers, 3545. A. Beard, 3563. T. S. G. Kirkpatrick, 3636. A. T. Becks, 3731. L. Epstein, 3770. E. E. H. Rousseau, 3762. J. Noble, 3784. A. K. Huntington and W. E. Kosch, 3831. D. Watson, 3858. W. S. Sutherland, 3864. B. Ford and J. Moncur, 3897. G. H. Blenkinsop, 3972. J. Imray (com.), 3978.

METERS, Measuring Liquids and Fluids, &c.—H. J. Haddan (com.), 3560. J. T. Dann, 3937.

MILK, &c.—H .W. L. O. Von Roden, 3695. D. Boyner (com.), 3943.

MINING, Boring and Blasting Rock, Raising from Mines, Getting Coals, Draining, Lighting, and Ventilating Mines.—E. C. Greening and H. J. Collins, 3506. J. Walker, 3612. J. Kitsee, 3844. W. R. Lake (com.), 3771. W. B. and G. J. Smith, 3911. J. Waddington, B. Longbottom, and Ashworth, 3983.

MONEY Tills and Boxes.—W. R. Lake (com.), 3586.

MOTIVE-POWER Machines, Obtaining Motive power.—P. R. Allen, 3478. E. G. Brewer (com.), 3526. H J. Haddan, (com.), 3630. J. T. M. Hircock, 3687. J. G. Jones, 3739. A. Kissam, 3780. J. Ferlinden, 3992.

MUSIC, &c.—W. A. Waddington, 3584. P. Ehrlich, 3660. L. Kustner, 3706. W. Carling, 3843. R. Whalley, 3960.

NECKTIES, Scarfs, Bows, Cravats.—R. T. Keymor and F. Theak, 3840.

NEEDLES, &c.—J, Hewitson and W. J. Napier, 3535. J. Darling, 3599.

NOZZLES, &c.—J. L. Norton and J. Sturgeon, 3484.

NUTS and Washers.—W. P. Thompson (com.), 3537. J. Mackay, 3887.

OILING or Lubricating, &c.—W. R. Lake (com.), 3553. B. A. Dobson, 3668. W. R. Lake (com.), 3888.

OILS, Fatty Matters, Grease.—J. Erskine, 3541. E. K. Mitting, 3792. H. J. Haddan (com.), 3892. D. Urquhart (com.), 3977.

OPTICAL Instruments, Optical Illusions, &c.—E. Edwards, (com.), 3889.

ORNAMENTING, &c.—A. L. Liberty, 3573. T. Markham, 3767.

OVENS and Kilns.—B. Finch, 3564. J. R. Chibnall, 3913. M. M. Brophy, 3960.

OXIDATION, (Preventing) &c.—W. E. Gedge (com.), 3651. E. P. Welles, 3796.

PACKING Pistons, &c.—W. R. Lake (com.), 2524. J. Brown, 3647.

PAINTS, Colours, Varnishes, &c.—D. Guille 3794. E. P. Welles, 3796. W. Astrop and R. Ridgeway, 3932. W. Kenyon, 3987.

PAPER Pasteboard, Papier Mache, Paper Hangings.—Y. Duxbury, 3692. G. W. Simmons, 3857.

PENS, Penholders, Pencils, Pencil Cases, &c.—J. A. Pickering, 3525. C. E. Bryant, 3738. J. Nadal, 3901. H. Searle and T. J. Ironside, 3984.

PHOTOGRAPHY and Photographic Apparatus.—E. G. Cotton (com.), 3491. E. Edwards (com.), 3889.

PIPES, Tubes, and Syphons: Joining Pipes.—J. H. Heathman, 3488. W. H. Simpson, 3574. W. H. Beck (com.), 3536. G. Sonnenthal (com.), 3662.

PISTONS, &c.—W. R. Lake (com.), 3524. R. R. Gubbins, 3890.

PLANTS, &c.—W. A. Barlow (com.), (com.), 3778.

PONTOONS, &c.—A. H. Williams, 3925.

PRESERVING Food, &c.—J. Jowitt and G. S. Page, 3539. E. de Pass (com.), 3697.

Preserving Miscellaneous Substances.—J. Jowitt and G. S. Page, 3539.

Printing and Transferring: Type and other Surfaces for Printing. Composing, and Distributing Type.—W. C. Kritch, 3481. M. Millington and R. Burton, 3518. E. A. Brydges (com.), 3659. A. H. Boulton and C. Dickie (com.), 3727. D. Guille, 3744. H. J. Haddan (com.), 3815. J. C. Mewburn (com.), 3818. W. R. Fordham, 3873. E. W. Brackelsberg, 3879. C. Toppan, 3905. W. A. Barlow 3939.

Propelling Carriages &c.—J. Walker, 2612. O. Mobbs and L. S. Moore, 3924.

Propelling Machinery, Transmitting Power and Motion, Converting Movements.—J. T. M. Hircock, 3637.

Propelling Ships, Propellers, Paddle-wheel, and Screws.—T. J. Edwards, 3642. A. Hardy, 3649. W. G. Wrench, 3709. G. C. Parini, 3733.

Pulleys, &c.—W. R. Lake (com.), 3553.

Pumps, Pumping and Forcing Liquids, Pumping and Raising Water and other Liquids, Pumps, Pistons and Packing.—E. G. Brewer (com.), 3526. W. W. Beaumont, 3658. W. B. Tibbits, 3942.

Railways, Carriages, Coupling, Uncoupling, and Altering Positions of Carriage and Engines.—F. Barnes, 3986.

Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables, &c. J. Revell, 3507. L. A. Groth (com.), 3679. J. Dickson, 3764.

Reflectors, &c.—A. P. Trotter, 3575.

Refrigerating and Freezing, Cooling Liquids Making Ices, &c.—T. Watts and W. Gorman, 3703. W. and G Lawrence, 3736.

Registering, &c.—P. R. Allen, 3478.

Roads, Paths, &c.—W. P. Thompson (com.), 3909.

Rods and Bars.—E. Deeley, 3673.

Ropes, &c.—J. Walker, 3612.

Safes, &c.—W. Corliss, 3517. W. R. Lake (com.), 3683.

Scents and Perfumes, Scent Bottles, &c.—E. J. C. Fear, 3725.

Scrapers, &c.—J. S. Willway, 3793.

Screens.—A. L. Liberty, 3873.

Sewing and Embroidering.—J. Darling, 3599. W. R. Lake (com.), 3657. H. Gardner, 3769. J. Imray (com.), (com.), 3788. J. E. Walsh 3860.

Shears, &c.—T. Green, 3682.

Ships and Boats, &c.—E. Lawson and E. W. de Rusett, 3624. C. W. Harding, 3827.

Ships' Boats (Raising) &c.—C. Grayson, 3556.

Ships' (Loading, &c.)—J. McAuley, 3499.

Ships Raising, (Sunken or Wrecked).—J. E. Hunter and J. Thomas, 3988.

Ships' Rigging, Sails, &c.—C. Court. 3493.

Shirts, Collars, &c.—G. W. von Nawrocki (com.), 3500. G. W. von Nawrocki (com.), 3641. H. Searle and T. J. Ironside, 3984.

Shot, Shell, Bullets, Cartridges, Percussion Caps, &c.—W. A. Barlow (com.), 3549.

Showcases, &c.—G. G. Tanner, 3947.

Sifting, Sorting, and Separating, &c.—J. Rossley and H. Vulliamy, 3490. W. R. Lake (com.), 3552. W. B. Dell (com.), 3617. T. S. G. Kirkpatrick, 3636. G. W. Murray, 3851.

Signals, &c.—W. B. Healey (com.), 3485. H. J. Haddan (com.), 3492. F. Hoe, 3531. H. Morris, 3565. A. C. Emery, 3637. J. Kitsee, 3644. H. J. Haddan (com.), 3667. S. Williams 3674. P. Prince, 3671. J. Harrison, 3699. W. R. Lake (com.), 3751. E. E. H. Rousseau, 3762. J. H. Johnson (com.), 3820. T. Hughes, 3852. G. Porter, 3855. R. H. Brandon, 3982.

Sizing, &c—Y. Duxbury, 3692. G. Heywood and S. Spencer, 3746.

Slabs, &c.—J. C. Bloomfield and J. McGurn, 3775.

Sounds, (Reproducing) &c.—F. Wirth (com.), 3457.

Sowing, Seeds, &c.—J. H. Johnson, 3839.

Spades, &c.—J. Imray (com.), 3561.

Spindles and Flyers.—W. P. Thompson (com.), 3615.

Spinning and Preparing for Spinning.—C. A. Day (com.), 3494. E. G. Brewer (com.), 3501. A. J, Boult (com.), 3509. J. Holmes, 3580. O. Imray (com.), 3602. B. A. Dobson, 3668. W. P. Thompson (com.), 3675. H. J. Haddan (com.), 3708. S. C. Sister, 3715. J. E. Heppenstall, 3748.

Springs.—G. H. Slack, 3747.

Stacking, &c.—F. Burt, 3945.

Stamps (Hand and Endorsing), &c.—E. A. Brydges (com.), 3659.

Starch, &c.—R. Edwards, 3910.

Stays, &c.—R. Hunting (com.), 3463. G. F. Redfern (com.), 3648. J. Ingleby (com.), 3865.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—J. G. Perkin and J. Scott, 3502. W. E. Gedge (com.), 3651. G. Sonnenthal 3662. H. Davey, 3787. E. Green, 3794. G. Sinclair. 3808. T. Hughes, 3852. J. Imray (com.), 3870. E. T. Hughes (com,), 3957. M. M. Brophy, 3960.

Steam Engines (Stationary, Locomotive, and Marine.)—P. R. Allen, 3478. J. B Fell, 3579. D. Forbes and J. Hayes, 3632. W. W. Beaumont, 3658. A. M. Clark (com.), 3677. C. H. Galloway and J. H. Beckwith, 3757. H. Davey, 3785. J. Beck, 3848. J. Edge, 3866. A. B. Brown, 3871. W. R. Lake (com.), 3888. P. Armington, 3914. J. Shanks and J. G. Lyon, 3981.

Steam Traps, &c.—H. Lancaster, 3663. L. Dove, 3832.

Steering and Guiding, &c.—J. H. Smiles, 3799.

Stenography, &c.—H. H. Lake (com.), 3633.

Stone, &c.—J. H. Johnson (com.), 3956. S. Cornforth, 3965.

Strontium.—G. W. von Nawrocki, (com.), 3601. D. Sidersky and H. Probst, 3609.

Sugar and Syrups, Glucose.—J. H. Johnson (com.), 3505. G. W. von Nawrocki (com.), 3607.

Sulphur, &c.—C. F. Claus, 3608.

Surgery, &c.—F. Wirth (com.), 3467. H. Hides (com.), 3516.

Tarpaulins, &c.—C. Court, 3493. T. Marlborough and J. Cunningham, 3664.

Teaching, &c.—H. J. Haddan (com.), 3546.

Telegraphs; Telegraph Printing Apparatus.—W. B. Healey (com.) 3485. S. Bidwell, 3513. J. Munro and B. Warwick, 3557. J. H. Johnson (com.), 3593. J. W. Fletcher, 3661. J. Cowan, 3681. G. M. Edwards, 3691. J. H. Johnson (com.), 3698. J. J. Barnier and F. T. de Lavernede, 3763. S. P. Thompson, 3803. H. J. Haddan (com.), 3815. H. C. Jobson, 3842. F. R. Wells (com.), 3882. B. H. Chameroy, 3946. C. J. Allport and R. Punshon, 3971. R. H, Braddon (com.), 3982.

Tents, &c.—O. Seydel, 3597.

Testing Fluids, &c.—J. Kitsee, 3644.

Thermometers, Barometers, Pyrometers, &c.—H. Morris, 3565.

Thrashing Machines, Reaping Machines—W. R. Lake (com.), 3772.

Tilling and Cultivating, &c.—A. Simpson, 3462. J. P. Goss snd F. Savage, 3568. J. Imray (com.) 3723. J. H. Johnson (com.), 3839.

Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—P. Everitt, 3567. W. R. Lake, (com.), 3656. S. W. Wood, 3895. O. W. T. Barnsdale, 3907. D. and J. Macdonald, 3970

Tools, &c.—D. Hummel (com.), 3801.

Toys.—W. R. Lake (com.), 3586. J. Fleischman (com.), 3894.

Tramway Carriages, &c.—O. Mobbs and L. G. Moore, 3924. F. Barnes, 3986.

Tramways, &c.—A. Vogt and A. Figge, 3653. H. Scott, 3859. S. Shields, 3876. H. H. M. Smith (com.), 3927.

Troughs, &c.—G. M. Edwards, 3691.

Turbines, &c.—J. McConnell, 3760.

Upholstery, &c.—D. H. Slack, 3747. W. R. Lake (com.), 3872. W. R. Lake (com.), 3926.

Urinals, &c.—G. Henderson and D. McMeil, 3930.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—J. Shanks, 3461. P. R. Allen, 3478. J. L. Norton and J. Sturgeon, 3484. W. Wright, 3511. W. Hunt, 3533.

Varnishes.—W. Morgan Brown (com.), 3631.

Velocipedes.—J. S. Orton, 3558. J. P. Dalby, 3600. J. Harrison, 3699. J. G. Horsey and T. Bell, 3730. J. T. Townsend, 3742. C. Crozat, 3781. J. Beale, 3782. W. T. Lewis, 3979.

Ventilating, &c.—J. Leather, 3488. J. L. Thomasson, 3554. H. Morris, 3565. C. E. Hanewald (com.), 3701. A. R. and J. N. Harding, 3758. E. E. H. Rousseau, 3962. W. J. Hinde, 3796. T. S. Wilson and H. T. Johnson, 3829. W. J. Henry, 3900.

Vices, &c.—W. M. McBran, 3849.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—B. Davies and J. Eckersley, 3542. G. Heywood and S. Spencer, 3746. C. C. Greenway, 3778.

Water-Closets, &c.—T. S. Wilson and H. Johnson, 3829.

Water power, &c.—S. S. Allen, 3951.

Waterproofing, &c.—C. Court, 3493.

Wearing Apparel, &c.—C. Court, 3493. J. W. Brewster, 3512. R. Redman, 3650. C. E. Bryant, 3738. W. Brierley (com.) 3936. H. Searle and T. J. Ironside, 3984.

Weaving, Braiding, Plaiting, Preparing for Weaving, &c.—J R. Braithwaite, 3470. T. Singleton, 3566. J. Hopkinson, 3615. H. J. Haddan (com.), 3627. H. J. Haddan (com.), 3628. H. J. Haddan (com.), 3629. H. H. Lake (com.), 3634. J. Whittaker and R. Clayton, 3669. J. Kirkman, R. Smith and P. Entwistle, 3672. J. Shorrock, 3810. S. Hollinrake, 3898. J. Bywater and C. Bedford, 3940. C. Calton, 3948.

Weighing, &c.—S. E. Mansfield, 3734. H. J. Haddan (com.), 3920.

Wheels for Carriages, &c.—A. M. Clark (com.), 3538. W. R. Lake (com.), 3717. H. J. Barrett, 3878. W. Morgan Brown (com.), 3885.

Wheels for Machinery.—W. R. Lake (com.), 3899.

Window Blinds and Sashes.—A. L. Liberty, 3573.

Windows, &c.—A. L. Liberty, 3575. T. Hyatt, 3614. W. Ney, 3696. C. H. Southall, 3811. H. J. Haddan (com.), 3817. G. J. Dickson, 3944. G. J. Dickson, 3959. J. Chaffin, 3969.

Wire, Wire Working, &c.—R. Hunting (com.) 3463. P. R. de F. d'Humy, 3666. G. M. Edwards, 3691. S. M. and A. Wood, 3805. H. C. Jobson, 3842. C. J. Allport and R. Punshon, 3971. J. H. Johnson (com.), 3980.

Wood, &c.—W. P. Thompson (com.), 3578. H. Glaser, 3761. T. Markham, 3767. G. P. Wells, 3790. W. Astrop and R. Ridgeway, 3932.

Wrenches, &c.—J. Brown, 3886.

⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

RECENT AMERICAN AND FOREIGN PATENTS.

Mr. Rufus W. Blake, of Derby, Conn., has patented a *bell attachment* for organs, constructed in such a manner that it can be conveniently applied to the organs, and can be readily applied to the organs, and can be readily thrown into and out of gear with the mechanism of the organ.

Quilting frames patented by Mr. John R. Sheldon, of Montiville, Conn. This invention relates to that class of quilting machines which carry the quilt under the needle arm of the sewing machine, and at the same time give it a transverse motion for stitching the pattern. It will form a perfect pattern and will stitch the last seam in the quilt perfectly.

A wagon hub has been patented by Mr. Angus McKellar, of Fort Douglas, Utah Territory. This invention consists of such construction of the metallic hub that the hub is adapted to be used on light freight, farm, and other wagons having wooden axles, the same number of spokes being used in the wheel as is ordinarily used with the wooden hubs used on such wagons.

An improvement in *pantaloons* has been patented by Mr. William Hyams, of New York city. The object of this invention is to make pants durable in the crutch and at the knees. The seat of the pants is made without a seam, and is thus made very strong and durable. It is connected directly with the fly by means of the tongue, so that in bending and stooping the strain will be altogether on the tongue, which is not apt to break off, as it is made integral with the seat—that is, cut out of one piece with the seat. The seams uniting the front and rear pieces at the crotch cannot be ripped or torn by the strain on the seat, as all this strain is taken up by the tongue. The pants are made with double thickness at the knee, and are very durable.

Reviews.

Poems and Songs. By THOMAS NEWBIGGING. Published by D. Bogue, St. Martin's Place, London.

THIS is a volume of poetry of an elevating and healthy character, and shows evidence of true poetic inspiration. We are much reminded of the pathetic power of Burns in some of the Scotch pieces, with which the volume abounds. It is particularly interesting to a man of science to find the poetic effusion before us the work of a professional engineer, as it shows the effect of great contrast in mental work, to be possible and natural in one and the same person. It is thus clearly proved that the scientific or mechanical mind is not only capable of appreciating, but of writing poetry; popular belief to the contrary notwithstanding.

Meteorological Chart. Straker, Bros., and Co., London.

WE have received a copy of a chart recently published by Capt. Jinman. F.R.M.S., which is of a novel and startling character. Captain Jinman's book, entitled "Winds and their Courses," of which a fourth edition we understand is about to be published, is the best possible guide to the chart under consideration. If, however, there be any truth in the theory laid down thereon, we should certainly be approaching a time when our knowledge of storms would be approximately as exact as that of the periods of revolution of the planetary system.

Without committing ourselves to the Captain's complete theory of meteorology, we are bound to admit that there are certain facts, which he would appear to have fairly established; such, for instance, as the non-circular form of so-called cyclones and anti-cyclones, which we believe is now admitted by the authorities at the Meteorological Office.

In a letter to us on the subject, Captain Jinman says: "By taking the period of revolution [at this latitude, Ed.]. forty-nine days, and taking the date of any remarkable storm, we can readily calculate when the same storm centre will pass over the same spot. Thus, the Euridice crossing passed on the 24th March, 1878, and every forty-nine days since it has passed again."

Now, these are matters which can be verified, and we should say that Captain Jinman will be most pleased to find meteorologists investigating his tabulated facts, for the purpose of getting at the true theory, whether such be as he has defined or otherwise. We may say that he has issued some very remarkable forecasts of storms, and we certainly do not seem to be dependent upon our American cousins for prognostications of a meteorological character.

ONLY ONE SENSE.

As, before the era of modern chemistry, people were content to take for granted, that the elements of all material substances were—earth, air, fire, and water—so they seem to have been satisfied to consider the faculties of smell, sight, taste, touch, and hearing to be, not only separate and distinct senses in themselves, but to be the ultimate and active causes of those different phenomena called sensations, which are observable in the human body. And indeed it would seem that mankind in general has been content to accept in this manner the mere outward appearance of things, down to very recent times. But we need hardly remind the present reader that modern scientific investigation and thought scarcely shrinks from the attempt to fathom any mystery, however venerable or profound. The object of this dissertation is to show that the action or operation of the senses is a mechanical one, and that that operation is of *one* sense only, manifested to our consciousness in different forms.

First, then, let us consider the faculty of hearing. We are well aware that many persons are quite content to be in possession of this faculty, as of all others, without caring to inquire into any explanation of the means whereby they enjoy that blessing. But, on the other hand, there are numerous students of nature who desire to know the why and the wherefore of these things, together with the modus operandi, so to speak, of our sensations.

Very little was known with regard to what takes place to produce that which we understand as sound, and to convey the impression thereof to the ear, and thence to the brain and consciousness, until mankind had arrived at that kind of research called experimental and inductive.

Amongst the early discoveries made with regard to sound was the fact that a sharp and very loud report would cause a strange sensation in the ear, and sometimes in the brain, of acute pain. Indeed, it was very early found that a great noise made close to the ear would probably result in derangement of that organ, thereby causing deafness of a permanent character; and we may safety presume that there are very few who have not suffered a *temporary* deafness from the same cause.

Again, it was found that, as compared with sight, sound travelled very slowly, so that, from the fact that men could see an operation in the distance some time before they heard the sound thereof, it has come to be well established and universally accepted, that so far as the faculty of hearing is concerned, the ear is simply an organ of a receptive character; waiting, as it were, to be acted upon by some operation such as that we call sound, which in some way influences it, so as to make us conscious of what is called the sense of hearing.

This is certainly a step gained, for it is a portion of the truth, and as such, is far preferable to the old idea of the ear being an active organ exercising some function by which it discovered sounds.

Now let us inquire a little further, and ask how sound is communicated? Of course we all know the modern scientific demonstration of this, and we only so far illustrate or recapitulate old illustrations, to enable us to build up the argument, which is intended to prove the entire mechanical nature of the action of the senses so called, and their reduction to one simple sense, being that of touch or feeling. If we take the trouble to notice a pianoforte wire, when it has been struck by the hammer, we at once perceive that the wire, while ever it emits any sound, is in a great state of agitation, or vibration, as it is technically called. And it has been demonstrated that every different sound is produced by a correspondingly different number of vibrations in the wire. That the slower the rate of vibration, or the smaller number within any given length of time, the lower in the scale will the tone of the sound be; and the quicker these vibrations take place, the higher will the tone be.

Now what does this point to? We venture to think that, properly reasoned, it really and absolutely proves that the vibration of the material particles of the wire, or other substance, is the primary activity, so far as we are concerned in this inquiry, and that what we call sound is a resultant. Let us follow this activity of the pianoforte wire, and observe the mode in which the effect is conveyed to the ear.

It is clear, that as the pianoforte wire is at a distance therefrom, there must be some intervening medium or substance which having some kind of vibrations or activities communicated to it by the wire, in its turn communicates similar activities to the tympanum of the ear, wonderfully adapted for receiving the activities of the particles of that intervening medium, which is usually the atmosphere. Thus we have, by the application of a certain force, a wire set in motion of a vibratory character, which sets the particles of air surrounding it in similar motion, and these in turn set the particles composing the drum of the ear in motion, and these again pass the same on, by means of the nerves, and under the same vibratory law, to the brain, and the whole nervous system of the body, so that there is truly a material and physical connection between the brain and the object from which the activity emanates, whereby the brain, by a mechanical process, is caused to feel the object, or rather, the activity of the object under consideration. There is also a way of actually being conscious of feeling the vibrations of sound with the nervous system, which is best comprehended by persons who are highly trained in music. They feel at times a peculiar sensation of the whole body, when certain chords of harmony have been played in very perfect tune, a sensation, something like electrical, and concentrating in the brain and spinal column. Take another illustration more generally understood, and which, we think, clearly proves the vibratory character of sensation.

If we place two pianos in a room, and there should be a wire in one piano which is tuned in exact accord with another wire in the second piano, we have a condition of things which would produce some very curious results. In the first place, whenever this one particular wire is struck in one piano, the corresponding wire in the other instrument would play the same note without any apparent cause or means. And secondly this response, as we may call it, would never occur except when this particular note is played. But if we could truly and exactly put every wire in one piano in mathematical accord with its corresponding wire in the other, we should have the second piano playing in response, a sort of echo of the music of the first. There is also the familiar illustration of the gas globe giving off a response to a musical note. We have seen people quite astonished when upon their singing a certain note, one of the gas globes has commenced to sound a response. But if we strike this globe we find it gives out the same tone. Now why is all this? It is because every vibrating body absorbs or is capable of absorbing the same number of vibrations that it gives. And of course if it receives a certain degree of motion, it will have set up within itself that self-same degree of motion, which is in fact the only one it can receive. Now if we bear in mind the fact of loud sounds producing pain in the ear and brain, and consider that it is the *tone* of a sound only which depends upon the speed of the vibrations, it becomes clear enough that what we call the sense of hearing is nothing more or less than an organism of a mechanical character, for receiving and transmitting certain activities of material substances, and that perhaps it would be more correct to say, we feel certain vibrations of particles by means of an organ called the ear, the act of feeling which motion we call hearing. To illustrate this, let us suppose a multitude of drums, and that by some mechanical arrangement a multitude of drumsticks are set into action above them; these would vibrate without sound, so long as they did not come into contact with the drums; but the moment they came into contact, then would follow the sound, the activity of the drumsticks remaining just as before. The activities of particles do exist; they existed always in matter, whether man had ears or not; but until instruments analogous to the auditory nerve and ear were brought into being, capable of contact or sympathetic action with the activities of such particles, no resultant sound could be produced.

(*To be continued.*)

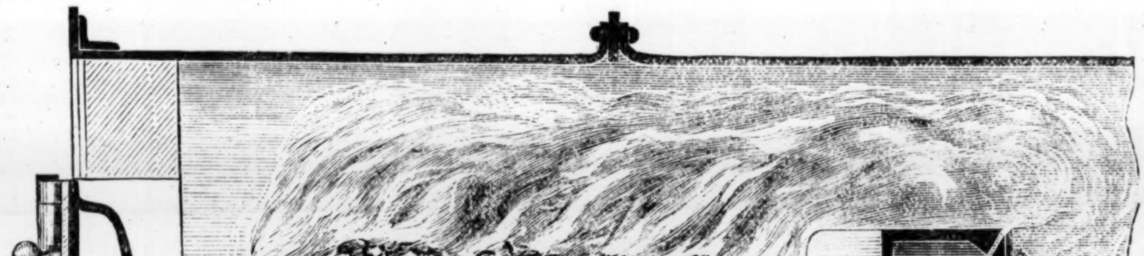
PREVENTION OF SMOKE.

This question has of late years assumed a very grave importance, and a large number of inventions, more or less effective, have been brought before the public for the purpose of consuming the smoke from furnaces of various kinds.

The inventor of the apparatus we are able to illustrate is Mr. James Shepherd, late Assistant Engineer to the Steam-user's Association and to the National Boiler Insurance Company, Limited, and although the plan has only recently been patented, it is already in operation to a large extent at soap works, dye works, silk and cotton mills, calico printers, and engineering establishments.

The apparatus requires neither the use of steam, self-acting valves, nor moving mechanism of any description. It is totally independent of attention from the fireman. There is no liability to disarrangement or to choke with ashes or dust. The whole of the parts are strong and substantial.

The principle employed is that of heating air to a high temperature before admission to the flues, so as to avoid any refrigeratory action in amalgamating with the gases from the surface. The hot air is distributed at a high level over the entire width of the flue in such a manner as to utilise the unburnt products of combustion, and to effectually prevent smoke.



Its operation is constant, being under the control of the draught. The heat of the furnace regulates the quantity of air passing though the heater. As the temperature of the furnace rises or falls, so the quantity of air passing into the gases is increased or diminished.

For a long time it has generally been considered necessary to exclude air from the furnace after the fuel has become fairly red upon the grate, and a great variety of appliances have been devised for this purpose. That this is an error we have no doubt, for as soon as coal gas (carburetted hydrogen) ceases to be evolved, the fuel on the bars is then in an incandescent state, and precisely in the condition to furnish a copious generation of the coke gas, *i.e.* carbonic oxide. Now the method before us permits air to mix with the gases at every stage of combustion as they pass from the firegrate over the bridge into the flues. This air is first heated by passing through the heater, as shown, and is broken and retarded in its passage to the required extent by means of the grids and baffle-plates placed in suitable positions therein.

It is not pretended by the inventor that an indiscriminate application of the apparatus will work a complete cure in all cases, for the simple reason that there are some instances where smoke prevention is out of the question until either the boiler or chimney power is increased. This modesty is the ordinary characteristic of the real and scientific inventor, as it is only charlatans and quacks who profess, by one means, to cure all the evils of boiler existence.

ELECTRIC LIGHTING.

Those speculators who are so anxious to invest their capital in electric light companies without due regard to their probabilities of success, or to the degree of progress as yet achieved in this department of science, will do well to ponder over the report of the Streets Committee of the City Commission of Sewers relative to the applications made for an extension of the experiments in electric lighting. They stated that Colonel Haywood had prepared plans for further experimenting in electric lighting, not only in the east but also in the north and west of the City, and it was agreed to form four districts for the purpose of inviting tenders for such work. They submitted an abstract prepared by the engineer of the tenders received, from which it appeared that the cost for twelve months, including the fixing of machinery, lamps, &c., ranged in the first district from £2,190 to £5,750, as against £551, the present cost of gas; in the second district from £2,350 to £4,270, as against £363 for gas; in the third district from £2,470 to £3,800, as against £341 for gas; and in the fourth district from £2,920 to £4,350, as against £612 for gas. Some of the companies coupled with their tender a request to be allowed to light private premises within the districts, and in one case the company offered to make the charge for lighting (irrespective of machinery, &c.) the same as for the gas saved, plus 20 cent. Looking at the experiments which the Commission had already carried out, and the great cost of extending them, as shown by the offers then submitted, the Committee were not prepared to recommend the Court to proceed further in the matter at present, the more so as by the Bill now before Parliament, and draft amendments suggested by the Board of Trade, it was proposed to give power to the local authorities to supply electricity, not only for public, but for private purposes, or to acquire compulsorily the undertakings of other parties after 15 years from the passing of the Act under which they may be empowered, and until Parliament had decided the principle upon which electric lighting generally should be permitted they considered it undesirable to incur further expense beyond that to which the Commission were already committed by the experiments now in operation.

SHIP CANALS.

At a time when it would appear that we are approaching to within measurable distance of a great engineering work, viz., the making of Manchester a seaport by deepening and widening the river Irwell sufficiently to allow ships of heavy burthen to navigate the same; and when also it seems seriously under consideration to in like manner improve the Humber, Aire, and Calder, so as to render these rivers navigable for vessels of similar draught, as far as the manufacturing town of Leeds,—it behoves scientific engineers to point out on all suitable occasions the advisability of carrying out these important works in such a manner that they would readily conform to the exigencies of a ship canal between Leeds and Manchester, by which means the important seaports of Hull, Grimsby, and Liverpool would be placed in direct water connection.

The importance of such a complete scheme can scarcely be over estimated, as by it vessels from Norway and Sweden and all Baltic ports could land their cargoes at Grimsby, Hull, Goole, Leeds, Manchester, or Liverpool as trade required. Added to this, the various American steamboats could extend their operations to both sides of the coast, or probably to German and other ports. If the surplus capital of the country were applied to engineering works of this description in our own beloved land, where there is the security of law and order, fewer financial losses would accrue than is often the case when the capital of our people goes to carry out works in far distant countries, where the security depends entirely on political considerations, and the chances of financial success are very problematical.

Mr. William F. Smith, of Overton, Texas, has patented an improved *baling press*, in which the bale box has the lower part of its ends made flexible and adapted to be elevated with the follower. The object of the invention is to facilitate the baling of cotton by simplifying the operation of introducing cotton into the press.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE,
(*Established* 1865.)

Is published on the first of every month at the
OFFICES, 21, COCKSPUR STREET, CHARING CROSS,
LONDON, S.W.

The Scientific Review will be sent post free on prepayment of the Annual Subscription of 6s. 6d.; or it may be had wholesale from Messrs. KENT and CO., Paternoster Row, or through any Bookseller or Newsagent in the kingdom, price 6d. per copy. Single copy post free from the office, 6½d.

The Scientific Review, having an old-established circulation, and being well read by Manufacturers, Capitalists, and others interested in inventions and enterprises for the promotion of industry, will be found a desirable medium to many Advertisers.

All Communications for Publication, Books for Review, and letters respecting Advertisements, Subscriptions, &c.—to be forwarded to the

Editor: 21, Cockspur Street, Charing Cross, S.W.

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE. LONDON.
Established 1st May, 1862.

President: His Grace the Duke of Manchester.

Past Presidents:

Sir David Brewster, K.H., LL.D., F.R.S., &c., from the establishment of the Inventors' Institute, till his decease, February, 1868. Lord Richard Grosvenor, M.P. Sir Antonio Brady, till his decease, 1881.

SESSION 1881—1882.

If any meeting be held special notice *per post* will be supplied.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

Proceedings of the Institute.

The Institute being out of Session there is nothing to report. It may, however, be interesting to some Inventors to know that "*The Rules of the Board of Trade as to the Electric Lighting Act*, 1882," may be obtained from P. S. King, King Street, Westminster; Knight and Co., 90, Fleet Street, E.C.; Shaw and Sons, Fetter Lane, E.C.; A. and C. Black, Edinburgh; and A. Thom and Co., Dublin.

The obituary of the month includes, according to the daily papers, the Inventor of the Bath Chair.

N.B.—As there is to be an Autumn Session of the Legislature the Members of the Institute should be prepared to do something for the Patent Laws, but nothing can be done without money, so the Council appeal to the members to leave no arrears unpaid, as fully paid up subscriptions make a vast difference in regard to the Finance department—and without *quantum suff.* no progress can be expected.

Monthly Notices.

Death of Professor Jevons.—It is our painful duty to record the death of Professor Jevons, from drowning, at Bexhill, on the Sussex coast, on August 15th. William Stanley Jevons, M.A., F.R.S., was born at Liverpool in 1835. He was educated at University College, London; held an appointment at the Australian Royal Mint, Sydney, from 1854 till 1859; took the M.A. degree at the University of London in 1862, and was made Fellow of his College in 1864. He was appointed Professor of Logic, Mental and Moral Philosophy, and Cobden Lecturer in Political Economy, in Owens College, Manchester, in June, 1866. In 1872 he was elected a Fellow of the Royal Society. In 1876 he received the honorary degree of LL.D., from the University of Edinburgh; and in the same year he resigned his professorship in Manchester on being appointed Professor of Political Economy in University College, London.

New Colouring Matters.—Herren Fischer and Rudolph have described to the Berlin Chemical Society a new class of colouring matters. Acetaniline acted on by chloride of lime at a temperature of 270° Cent. produces a beautiful yellow, to which the name of flavaniline yellow is given. On silk fibres the colour is especially brilliant, with a remarkable green fluorescence.

A Technical School is about to be established for Leicester, the main features of which will be to give instruction in the technology of spinning and framework knitting. The movement has been undertaken by the Chamber of Commerce and the Rev. Canon Vaughan.

The Trade of the United Kingdom.—The annual statement of the trade of the United Kingdom for 1881 has been issued as a parliamentary paper. From this it appears that the total value of exports and imports for 1881 was £694,105,264, as against £697,644,031 in 1880, £611,775,239 in 1879, £614,254,600 in 1878, and £646,765,702 in 1877. The imports were £ 97,022,489 in 1881, as against £411,229,565 in 1880, £362,991,875 in 1879, £368,770,742 in 1878, and £394,419,682 in 1877; while the exports were £297,082,775 in 1881, as against £286,414,466 in 1880, £248,783,364 in 1879, £245,483,858 in 1878, and £252,346,020 in 1877.

A Venomous Lizard.—Stories about venomous lizards of different species are abundant in India and other tropical countries, but on investigation have always been found to be destitute of foundation. There is, however, one lizard of which the bite is certainly highly dangerous, though probably not fatal, to man. This is the Heloderm (*Heloderma horridum*) of Mexico and Lower California, commonly known to the natives of those countries as the "scorpione" or scorpion. An example of this lizard has lately been presented to the Zoological Society's collection by Sir John Lubbock, and may now be seen in the reptile house. The deadly effect of the bite of this lizard upon small mammals has been proved by actual experiment, and Mr. J. Stein, a traveller in Mexico, who was bitten in the finger by one, suffered from symptoms similar to those produced by a snake bite. The specimen in the Zoological Society's collection is about 15in. long, and was forwarded to Sir John Lubbock by Mr. Treadwell, of the Central Arizona Mining Company. It is believed to be the first that has reached Europe alive.

The Velocity of Chemical Actions.—The velocity of chemical actions has been engaging the attention of a Russian chemist, M. Kœjœnder. His experiments consisted in dissolving marble or magnesium in water acidulated to various degrees with different acids. The curves of velocity of dissolution have a striking resemblance to those representing electric conductivity. The solubility increases with the quantity of the acid up to a certain point, beyond which it decreases. It is remarkable, too, that the velocity of the reaction referred to the proportions concerned is greater the lower the concentration. Thus, 1 of sulphuric acid dissolves in a second more than half what 2 will dissolve, and still more than a third what 3 will dissolve. The phenomenon becomes more and more pronounced.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

SEPTEMBER, 1882.

THE BRITISH ASSOCIATION.

Southampton Meeting.

This 52nd meeting was presided over by Dr. C. W. Siemens, a member of the Inventors' Institute (*ab origine*), and we cannot now do more than inform our readers of his presidency, and epitomise his admirable address.

The consideration of Captain Bedford Pim's motion that the Association shall meet next year in Canada was postponed.

Previous to the address the following were made vice-presidents of the meeting :—In Mathematics, Professors Adams, Werner Siemens, Dr. W. Spottiswoode, Sir W. Thomson, and Mr. Glaisher ; in Chemical Science, Dr. Abel, Dr. Gladstone, and Professor Williamson ; in Geology, Dr. Evans and Mr. Pengelly ; in Biology, Professor Raymond, Dr. Sclater, Dr. Allen Thomson, Sir J. Hooker, and Sir J. Lubbock ; in Geography, Sir F. Evans, Mr. P. Tchihatchef (of Florence), Mr. Ommanney, Major-General Cooke, and Sir J. Hooker ; in Economics, the Mayor of Southampton, Professor Leone Levi, and Dr. Hyde Clarke ; and in Mechanics, Mr. Barlow, Sir J. Hawkshaw, Captain D. Galton, Sir F. Bramwell, Mr. T. Hawksley, and Mr. F. Bateman.

Sir J. Lubbock, the last President, introduced Dr. Siemens to the chair in terms of general scientific encomium, aptly remarking that if any one could, Dr. Siemens would stop the waste of coal now hanging in a smoky pall over our great cities, and restore to them pure air, bright sunshine, and blue skies. Though our coal, however economised, must one day be exhausted, we might by that time be able to store up summer heat for winter use.

Dr. Siemens opened his address with an allusion to the sad death of Professor Balfour, the hon. secretary of the Association. He then said, at this, the first ordinary gathering in the second half century of the history of the Association, it behoved them to consider what were the strong points to rely upon for the continuance of a career of success and usefulness. The advancement of the last fifty years had rendered theory and practice so interdependent, that an intimate union between them was a matter of absolute necessity for our future progress. It was to the man of science who also gave attention to practical questions, and to the practitioner who devoted part of his time to the prosecution of strictly scientific investigations, that we owed the rapid progress of the present day, both merging more and more into one class—that of pioneers in the domain of nature. The subjects discussed at their meetings were, without exception, of general interest, but many of them bore an international character, such as the systematic collection of magnetic, astronomical, meteorological, and geodetical observations, the formation of a universal code for signalling at sea, and for distinguishing lighthouses, and especially the settlement of scientific nomenclatures and units of measurement, regarding all of which an international accord was a matter of the utmost practical importance. As regarded the measures of length and weight, he regretted that this country still stood aloof from the movement initiated in France towards the close of last century ; but considering that in scientific work metrical measure was now almost universally adopted, and that its use had been already legalised in this country, he hoped that its universal adoption for commercial purposes would soon follow as a matter of course. The practical advantages of such a measure to the trade of this country would be very great, for English goods, such as machinery or metal rolled to current sections, were now almost excluded from the Continental market, owing to the unit measure employed in their production. The principal impediment to the adoption of the metre consisted in the strange anomaly that, although it was legal to use that measure in commerce, and although a copy of the standard metre was kept in the Standards Department of the Board of Trade, it was impossible to procure legalised rods representing it, and to use a non-legalised copy of a standard in commerce was deemed fraudulent. Would it not be desirable that the British Association should endeavour to bring about the use in this country of the metre and kilogramme, and, as a preliminary step, petition the Government to be represented on the International Metrical Commission ? Next in importance to accurate measures of length, weight, and time, stood, for the purposes of modern science, those of electricity. If electricity stood foremost amongst the exact sciences, it followed that its unit measures should be determined with the utmost accuracy. In the "practical system" as distinguished from the "absolute system," the units are named after leading physicists, the Ohm, Ampere, Volt, Coulomb, and Farad. He suggested that two further units might with advantage be added to the system decided on by the International Congress at Paris. The first of these was the unit of magnetic quantity or pole. It was of much importance, and few would regard otherwise than with satisfaction, the suggestion of Clausius that the unit should be called a "Weber," thus retaining a name most closely connected with electrical measurements, and only omitted by the congress in order to avoid the risk of confusion in the magnitude of the unit current with which his name had been formerly associated. The other unit he would suggest adding to the list was that of power. It might be appropriately called a "Watt," in honour of James Watt, who first had a clear physical conception of power, and gave a rational method of measuring it. A Watt, then, would express the rate of an Ampere multiplied by a Volt. Regarding the transmission of power to a distance, the electric current had now entered the lists in competition with compressed air, the hydraulic accumulator, and the quick running rope as used at Schaffhausen to utilise the power of the Rhine fall. The transformation of electrical into mechanical energy could be accomplished with no further loss than was due to such incidental causes as friction and the heating of wires ; in actual practice, however, it would not be safe at present to expect more than 50 per cent. of ultimate useful effect, to allow for all mechanical losses. The small space occupied by the electro-motor, its high working speed, and the absence of waste products, rendered it specially available for the general distribution of power to cranes and light machinery of every description. A loss of effect of 50 per cent. did not stand in the way of such applications, for it must be remembered that a powerful central engine of best construction produced motive power with a consumption of two pounds of coal per horse-power per hour, whereas small engines distributed over a district would consume not less than five; thus there was an advantage in favour of electric transmission as regarded fuel, independently of the saving of labour and other collateral benefits. To agriculture, electric transmission of power seemed well adapted for effecting the various operations of the farm and fields from one centre. Having worked such a system in combination with electric lighting and horticulture for upwards of two years, he could speak with confidence of its economy, and of the facility with which the work was accomplished in charge of untrained persons. As regarded the effect of electric light upon vegetation, in experimenting upon wheat, barley, oats, and other cereals sown in the open air, there was a marked difference between the growth of the plants influenced and those uninfluenced by the electric light. This was not very apparent till towards the end of February, when, with the first appearance of mild weather, the plants under the influence of an electric lamp of 4000-candle power, placed about five metres above the surface, developed with extreme rapidity, so that by the end of May they stood above 4ft. high, with the ears in full bloom, when those not under its influence were under 2ft. in height, and showed no sign of the ear. The electric railway possessed great advantages over horse or steam power for towns, in tunnels, and in all cases where natural sources of energy, such as waterfalls, were available; but it would not be reasonable to suppose that it would in its present condition compete with steam propulsion upon ordinary railways. The deposition of metals from their solutions was perhaps the oldest of all useful applications of the electric current, but it was only in very recent times that the dynamo current had been practically applied to the refining of copper and other metals, as now practised at Birmingham and elsewhere, and upon an exceptionally large scale at Ocker, in Germany. Electric energy might also be employed for heating purposes, but in that case it would obviously be impossible for it to compete in point of economy with the direct combustion of fuel for the attainment of ordinary degrees of heat. Its specific advantage consisted in being apparently unlimited in the degree of heat attainable, thus opening out a new field of investigation to the chemist and metallurgist. The largest and most extensive application of electric energy at the present time was to lighting, but, considering how much had of late been said and written for and against this new illuminant, he would here (the *Standard*, from which we quote) confine himself to a few general remarks. The principal argument in favour of the electric light was furnished by its immunity from products of combustion, which not only heat the lighted apartments, but substitute carbonic acid and deleterious sulphur compounds for the oxygen upon which respiration depends; the electric light was white instead of yellow, and thus enabled them to see pictures, furniture, and flowers as by daylight; it supported growing plants instead of poisoning them, and by its means they could carry on photography and many other industries at night as well as during the day. The objection frequently urged against the electric light—that it depended upon the continuous motion of steam or gas engines, which were liable to accidental stoppage—had been removed by the introduction into practical use of the secondary battery. This had lately been greatly improved in power and constancy, and promised to accomplish for elecricity what the gas-holder had done for the supply of gas and the accumulator for the hydraulic transmission of power. It could no longer be a matter of reasonable doubt, therefore, that electric lighting would take its place as a public illuminant, and that even though its cost should be found greater than that of gas, it would be preferred for the lighting of drawing-rooms and dining-rooms, theatres and concert-rooms, museums, churches, warehouses, show-rooms, printing establishments, and factories, and also the cabins and engine-rooms of passenger steamers. In the cheaper and more powerful form of the arc light it had proved itself superior to any other illuminant for spreading artificial daylight over the large area of harbours, railway stations, and the sites of public works. When placed within a holophote, the electric lamp had already become a powerful auxiliary in effecting military operations both by sea and land. The electric light might be worked by natural sources of power, such as waterfalls, the tidal wave, or the wind, and it was conceivable that these might be utilised at considerable distances by means of metallic conductors. The advantages of the electric light and of the distribution of power by electricity had lately been recognised by the British Government, who had passed a Bill through Parliament to facilitate the establishment of electrical conductors in towns, subject to certain regulating clauses to protect the interests of the public and of local authorities. Assuming the cost of electric light to be practically the same as gas, the preference for one or other would in each application be decided upon grounds of relative convenience, but he ventured to think that gas-lighting would hold its own as the poor man's friend. Gas was an institution of the utmost value to the artisan; it required hardly any attention, was supplied upon regulated terms, and gave with what should be a cheerful light a genial warmth, which often saved the lighting of a fire. The time was, moreover, not far distant, he ventured to think, when both rich and poor would largely resort to gas as the most convenient, the cleanest, and the cheapest of heating agents, and when raw coal would be seen only at the colliery or the gas works. In all cases where the town to be supplied was within, say, 30 miles of the colliery, the gasworks might with advantage be planted at the mouth, or, still better, at the bottom of the pit, whereby all haulage of fuel would be avoided, and the gas, in its ascent from the bottom of the colliery, would acquire an onward pressure sufficient probably to impel it to its destination. The possibility of transporting combustible gas through pipes for such a distance had been proved at Pittsburg, where natural gas from the oil district was used in large quantities. The quasi-monopoly so long enjoyed by gas companies had had the inevitable effect of checking progress. The gas being supplied by meter, it had been seemingly to the advantage of the companies to give merely the prescribed illuminating power, and to discourage the invention of economical burners, in order that the consumption might reach a maximum. The application of gas for heating purposes had not been encouraged, and was still made difficult in consequence of the objectionable practice of reducing the pressure in the mains during daytime to the lowest possible point consistent with prevention of atmospheric indraught. The introduction of electric light had convinced gas managers and directors that such a policy was no longer tenable, but must give way to one of technical progress; new processes for cheapening the production and increasing the purity and illuminating power of gas were being fully discussed before the Gas Institute; and improved burners, rivalling the electric light in brilliancy, greeted their eyes as they passed along the pricipal thoroughfares. The capital invested in gasworks in England, other than those of local authorities, amounted to £30,000,000. The total annual value of the gasworks by-products, including colouring-matter, sulphate of ammonia, pitch, creosote, crude carbolic acid, and gas coke, was estimated at £8,370,000, which was nearly three millions above the value of the coal used. In using raw coal for heating purposes, these valuable products were not only absolutely lost to us, but in their stead we were favoured with those semi-gaseous by-products in the atmosphere too well-known to the denizens of London and other large towns as smoke. Professor Roberts had calculated that the soot in the pall hanging over London on a winter's day amounted to fifty tons, and that the carbonic oxide—a poisonous compound—resulting from the imperfect combustion of coal might be taken as at least five times that amount. Mr. Aitken had shown, moreover, that the fine dust resulting from the imperfect combustion of coal was mainly instrumental in the formation of fog; each particle of solid matter attracting to itself aqueous vapour; these globules of fog were rendered particularly tenacious and disagreeable by the presence of tar vapour, another result of imperfect combustion of raw fuel, which might be turned to much better account at the dye-works. The hurtful influence of smoke upon public health, the great personal discomfort to which it gave rise, and the vast expense it indirectly caused through the destruction of our monuments, pictures, furniture, and apparel, were now being recognised. The most effectual remedy would result from a general recognition of the fact that wherever smoke was produced fuel was being consumed wastefully, and that all our calorific effects, from the largest down to the domestic fire, could be realised as completely and more economically without allowing any of the fuel employed to reach the atmosphere unburnt. This most desirable result might be effected by the use of gas for all heating purposes, with or without the addition of coke or anthracite. The greater efficiency of gas as a fuel resulted chiefly from the circumstance that a pound of gas yielded in combustion 22,000 heat units, or exactly double the heat produced in the combustion of a pound of ordinary coal. This extra heating power was due partly to the freedom of the gas from earthy constituents, but chiefly to the heat imparted to it in effecting its distillation. Recent experiments with gas burners had shown that in this direction also there was much room for improvement. In the production of mechanical effect from heat, gaseous fuel also presented most striking advantages. Before many years had elapsed they would find in their factories and on board their ships engines with a fuel consumption not exceeding one pound of coal per effective horse-power per hour, in which the gas producer took the place of the somewhat complex and dangerous steam boiler. The advent of such an engine and of the dynamo-machine must mark a new era of material progress at least equal to that produced by the introduction of steam power in the early part of our century. If to the improvements already achieved in our merchant navy could be added an engine of half the weight of the present steam engine and boilers, and working with only half the present expenditure of fuel, a further addition of 30 per cent. could be made to the cargo of an Atlantic propeller vessel—no longer to be called a steamer; and the balance of advantages in favour of such vessels would be sufficient to restrict the use of sailing craft chiefly to regattas. Sir William Thomson had enriched the art of navigation by the invention of two sounding machines; the one being devised for ascertaining great depths very accurately in less than one quarter the time formerly necessary, and the other for taking depths up to 130 fathoms without stopping the ship in its onward course. The value of the latter instrument for guiding the navigator within what he calls "soundings" could hardly be exaggerated; with a sounding machine and a good chart he could generally make out his position correctly by a succession of three or four casts in a given direction at given intervals, and thus in foggy weather was made independent of astronomical observations and of the sight of lighthouses or the shore. By the proper use of this apparatus, such accidents as happened to the mail steamer Mosel not a fortnight ago would not be possible. The time allowed him was wholly insufficient to do justice to the great engineering works of the present day, and he must therefore limit himself to making a short allusion to a few only of the more remarkable enterprises. The President briefly named the Panama Canal, Captain Eads's ship railway over the same isthmus, the flooding of the Tunis-Algerian Chotts, thereby re-establishing the Lake Tritonis of the ancients; the completion of a new Eddystone Lighthouse in substitution for the *chef d'œuvre* of engineering erected by John Smeaton more than one hundred years ago; and the accomplishment of the St. Gothard tunnel. Whether we should be able to connect the English with the French railway system by means of a tunnel below the English Channel was a question that appeared dependent at this moment rather upon military and political than technical and financial considerations. The occurrence of a stratum of impervious grey chalk, at a convenient depth below the bed of the Channel, minimised the engineering difficulties in the way, and must influence the financial question involved. The protest lately raised against its accomplishment could hardly be looked upon as a public verdict, but seemed to be the result of a natural desire to pause pending the institution of careful inquiries. Whether the Channel Tunnel was constructed or not, the plan proposed some years ago by Mr. John Fowler of connecting England and France by means of a ferry boat capable of taking railway trains would be a desideratum justified by the ever-increasing intercommunication between this and other countries. The estuaries of the Severn and of the Mersey were being undermined in order to connect the railway systems on the two sides, and the Frith of Forth was about to be spanned by a bridge exceeding in grandeur anything as yet attempted by the engineer. Armed with greatly improved apparatus, the physical astronomer had been able to reap a rich harvest of scientific information during the short periods of the last two solar eclipses; that of 1879, visible in America, and that of May last, observed in Egypt by Lockyer, Schuster, and by Continental observers of high standing. The result of this last eclipse expedition had been summed up as follows:—"Different temperature levels have been discovered in the solar atmosphere; the constitution of the corona has now the possibility of being determined, and it is proved to shine with its own light. A suspicion has been aroused once more as to the existence of a lunar atmosphere, and the position of an important line has been discovered. Hydro-carbons do not exist close to the sun, but may in space between us and it. In the great workshop of nature much was to be done—and all the knowledge must lead up to the intelligent recognition of the Creator through His works.

The meeting next year will be held at Southport, under the Presidency of Professor Cayley.

Proceedings of Societies.

MATHEMATICAL SOCIETY.

June 8.—Mr. S. Roberts, President, in the chair.—Messrs. Berry, Forsyth, and J. Wood were elected Members, and Mr. R. A. Roberts was admitted into the Society.—The following communications were made: "On the Extension of certain Theories relating to Plane Cubics to Curves of any Deficiency," by Mr. A. Buchheim,—"On the Differentiation with respect to the Modulus of the Amplitude of Elliptic Functions," by Rev. M. M. U. Wilkinson,—"Two Notes: (1) a Definite Integral; (2) Equation of the Director-circle of a Conic," by Prof. Wolstenholme.—and "Theory of Orthoptic Loci," by Rev. Dr. Taylor.

SOCIETY FOR THE PROMOTION OF HELLENIC STUDIES.

June 15.—Annual Meeting.—Prof. C. T. Newton in the chair.—The following is the substance of the report of the Council. The most important event in the history of the Society during the past year was its share in Mr. Ramsay's Phrygian Expedition. At Mr. Ramsay's suggestion the Society sent out, by means of a fund raised for the occasion, an artist, Mr. A. C. Blunt, to accompany the expedition. The results of the journey, including the discovery of some very remarkable rock-tombs in Phrygia, were recorded in Mr. Ramsay's paper which opened the new volume of the *Journal of Hellenic Studies*. With the paper were published some of Mr. Blunt's drawings. Others would be given with a subsequent paper. On the whole, the Society might fairly be congratulated on the result of its first venture in the field of exploration, and feel encouraged to further efforts in the same direction. To this end it was most important that its numbers should be increased, and members were urged to exert themselves to secure candidates for election. The Society now numbered rather more than five hundred, but this, though encouraging, was by no means so great an increase as could be wished. With a view to carrying into effect one of the principal objects indicated in the Society's rules, the Council had sanctioned the reproduction by photography of the famous Laurentian Codex of Sophocles, provided that one hundred subscribers could be found at £6 each, the total cost for one hundred copies being calculated not to exceed £600. A circular would be issued to members, and the Council hoped that there would be no difficulty in making up the subscription. Another appeal which the Council had decided to sanction, though undertaking no responsibility, was for a fund of £500 to enable Mr. Ramsay to fulfil the conditions of an Extraordinary Fellowship, to which, in the interests of archæology, one of the colleges at Oxford was prepared to appoint him, with a view to his continuing his researches in Asia Minor. The Council thought that this appeal deserved the hearty support of members of the Society. The fund would be administered by a committee appointed by the subscribers. The Council then stated that since the last annual meeting arrangements had been made for the use by members of the various books and periodicals which had been acquired by the Society. The rules were in the hands of members. In regard to the *Journal of Hellenic Studies*, the Council thought that if the standard of the first two volumes could be maintained the success of this department of the Society's work was assured. The balance-sheet showed an income which, including last year's balance, amounted to £1,575 16s. 1d., as against an expenditure of £522 14s. 5d. The present balance was therefore £664 11s., 8d., over and above the life subscriptions, £388 10s., which had been invested in Consols. Arrears of subscriptions were due the amount of £139 13s. On the whole, looking back over the third year of the Society's existence, the council could congratulate members on its continued prosperity and on valuable work done. But constant exertion was needed, on the part alike of the Council and of individual members, to enable the Society to carry out effectively in every department the objects which it professedly had in view.

ASTRONOMICAL SOCIETY.

June 9.—Mr. E. J. Stone, President, in the chair.—Mr. F. G. Evans was elected a Fellow.—A paper was read from Prof. E C. Pickering, giving a description of the instrument employed at the observatory of Harvard College for photometric observations of stars on or near the meridian, of not less than the tenth magnitude.—A paper was also read from Dr. H. Draper, of New York, accompanying reproductions of a photograph of the nebula in Orion. The negative had been taken with an exposure of 137 minutes, and showed a large portion of the nebula and many small stars. Dr. Draper hoped to be able with still longer exposures to photograph stars which could not be seen in the telescope. He contemplated arrangements which would permit of an exposure of six hours.—Mr. Maunder read a paper "On Spectroscopic Observations of Comet Wells made at the Royal Observatory, Greenwich." The most striking feature in the spectrum was the remarkable development of a line in the yellow, apparently corresponding with the D line of sodium.—A note on the same subject by M. Dunér, of the Lund Observatory, was also read.—Mr. Hind gave some practical directions for the observation of comet Wells in daylight.—Mr. Knott read a paper on the variable star U Cephei.—The President gave an account of the arrangements which have been made for the observation of the transit of Venus in December next. He considered that there was good reason to hope that the sun's distance would be determined within half a million miles.—The following papers were also announced and partly read: "Measures of the Companion to Sirius," and "Observations of Double Stars made at Chicago in 1879 and 1880," by Mr. Burnham.—"Sur les récentes Observations de M. Schiaparelli sur la Planète Mars," by Dr. Terby,—"Transits of the Red Spot across the Central Meridian of Jupiter," by Prof. C. W. Pritchett,—"The Solar Eclipse, 1882, May 16th," by Mr. Perry, — "On possible Perturbations in Cometary Orbits caused by Nucleur Jets," and "Note on Lunar Photographs," by Mr. Burton,—"Sextant Observations of Comet *b*, 1881, by Capt. Parsons,—"Remarks on Prof. Newcomb's Paper on the Instructions for observing the Transit of Venus," by Mr. Stone,—"On M. Loewy's Communication referring to an Apparatus for determining Flexure Errors," "On the best Method for determining the Errors of Division of Circles and Scales," and "Ephemeris for Physical Observations of Jupiter," by Mr. Marth,—"Curves showing the Changes in the Diameter of the Moon, from the Greenwich Observations, 1750 to 1830," by Mr. Stone, —and "Elements of Comet Wells, obtained Graphically," by Mr. Penrose.

SOCIETY OF ANTIQUARIES.

June 15.—The Earl of Carnarvon, President, in the chair.—On taking his seat Lord Carnarvon called attention to the clauses and amendments which had been introduced —several of them on his own motion—into the Bishop of London's Benefices Bill, which it was feared would lead to the further destruction of not a few churches of considerable historical interest and of no small architectural beauty. It was to avert this distruction that the Society, on the 4th of May (see *ante*), had passed a resolution calling Lord Carnarvon's attention to this very objectionable measure; and a vote of thanks was this evening awarded to the President for his efforts—and to a large extent successful efforts—in rescuing the threatened churches from wanton destruction.—Mr. C. Baker exhibited a parish bell, formerly used by the town crier at Crickhowell, Breconshire, bearing the inscription "Momento mori" and the date 1638.—Mr. H. M. Westropp exhibited a small bronze statue of Apollo, of an archaic type.—An account was read of some Gallo-Roman excavations which had recently been carried on, with important results, in Poiton by the Père Camille de la Croix.—Mr. G. Payne, jun., communicated some notes on Anglo-Saxon objects found near Sittingbourne last March, also on the remains of a Roman building near Lower Halstow, Kent, and on some sepulchral cists discovered in Gorsley Wood, near Bridge, Kent. The paper was accompanied by an exhibition of pottery, glass, and bronze of great interest.—Mr. E. Griffith exhibited some deeds relating to the Abbey of Burton, on which the Director read some illustrative remarks.

June 29.—Mr. Edwin Freshfield, V.P., in the chair.—The Chairman exhibited certain register and other parochial books belonging to the parish of St. Christopher-le-Stocks, which at the present time were in his custody. Mr. Freshfield quoted from them some curious particulars relating to the Great Plague.—Mr. H. B. Wheatley exhibited, by permission of Miss Nicholas, an oval snuff-box of boxwood, with the royal arms of England and the initials C.R. carved on the lid; beneath the royal arms was a coat quarterly, which appeared to belong to the family of Wolstenholme.—Dr. C. S. Perceval gave an interesting report of the progress he had made in the arrangement (voluntarily undertaken by him) of the Society's collection of seals. A considerable portion of this report was devoted to discussing the proper classification of seals, both ecclesiastical and lay, and it appeared that Dr. Perceval had found reason to adopt some important modifications of the system drawn out by the late Mr. W. S. Walford in a well-known paper in the *Archæological Journal*.—Mr. J. H. Parker communicated some notes on a series of curious carvings of bench-ends in the church of Trull, Somerset, which presented some remarkable specimens of costume of the date of Queen Elizabeth.—The Society then adjourned till November.

LINNEAN SOCIETY.

June 15.—Sir J. Lubbock, in the chair.—The following were elected Fellows: Sir J. R. Gibson-Maitland, Rev. R. Collie, Rev. H. A. Soames, Messrs. C. A. Ferrier, W. D. Gooch, T. D. Gibson-Carmichael, M. Murphy, H. C. Stephens, H. G. W. Stephens, and J. Turner.—Mr. W. T. Thiselton Dyer exhibited specimens of *Equisetum giganteum* from Brazil, which is said to have aërial stems attaining thirty feet.—Mr. C. B. Clarke drew attention to a bundle of Hampshire Orchis in support of his view regarding the *O. incarnata*, L.—Mr. H. N. Ridley showed a *Carex glauca* with two pedicle spikes and lower male spike, each arising from a complex utricle; and he also showed a specimen of *Lolium perenne* exemplifying transition from glumes to carpellary leaves.—Mr. G. J. Fookes exhibited and explained peculiarities of malformation in specimens of wallflower and *Clematis lanuginosa* var. *alba*.—Sir J. Kirk gave information concerning specimens of fruit, leaves, and the rubber of *Landolphia florida*, obtained from the island of Pemba, north of Zanzibar; and he showed native bells and rubber beaters from East Central Africa, pointing out the beaters were the only application of the rubber made use of by the negroes.—Sir J. D. Hooker read a paper on the Dyera, a new genus of rubber-producing plants belonging to the natural order Apocyneæ, from the Malayan Archipelago.—Mr. W. Thistleton Dyer followed by a communication "On the Caoutchouc-yielding Apocynaceæ of Malaya and Tropical Africa."—Prof. E. Ray Lankester read "Notes on some Habits of Scorpions." Of *Androctonus funestris* he related their manner of burrowing in the sand, making horizontal tunnels occasionally eight inches long. The process of exuviation was also witnessed, when the scorpion, pushing its large chelæ into the sand, scraped rapidly backwards and forwards with the three anterior pairs of walking legs. Androctonus is evidently timid; in walking this genus raises its body from the ground, and the tail and sting are carried highly arched over the back. Euscorpius, on the contrary, keeps its body low, and drags the tail behind with only a slight bent tip. Androctonus feeds chiefly at dusk, and then, seizing its prey by the left chelæ, archedly swings its tail overhead and pierces its victim with its sting, afterwards grasping the body by the short chelicerae and sucking the putrient substances. The specimens of Euscorpius fought with each other, then only using the chelæ and not the sting.—Mr. G. Brook read a paper "On a new Genus of Collembola (Sinella) allied to Degeeria, Nic." The former differs from the latter in having four and not sixteen eyes, in the absence of the long abdominal hairs, and in the different construction of the claws and mucrones.—Mr. R. McLachlan gave a communication "On a Marine Caddisfly from New Zealand," material for examination of this curious discovery have been received by the author from Prof. Hutton, of Canterbury, N.Z., who found larvæ, &c., in rock pools between high and low water mark in Lyttelton Harbour. The small pupa case is surrounded and strengthened by fragments of a coralline. Mr. McLachlan finds that the caddisfly in question has been referred to as Philanisus by Walker and apparently equivalent to the genus Anomalostoma of Brauer, but neither of these authorities appears to have known anything of the insect's habits.—Prof. P. M. Duncan, in a paper "On the Genus Pleurochinus, L., Agass.," proves it to be a subgenus of Temnopleurus, and distinct from Temnochinus and the nummulitic Temnopleuridæ of D'Archiac.—Mr. F. M. Campbell detailed some interesting observations "On a Probable Case of Parthenogenesis in the House Spider," virgin reproduction not having hitherto been recorded among the Araneideæ.—Messrs. W. H. Pollock and G. J. Romanes gave an account of experiments leading to the belief that Actiniæ have possibly a sense of smell, but of a diffused kind.—The following papers were afterwards read: "On the Fungi of Queensland, Australia," by the Rev. M. J. Berkeley and Mr. C. E. Broome,—"On a new Infusorian allied to Pleuronema," by Mr. F. W. Phillips,—"On *Teredo utriculus*, Gm., and other Shipworms," by Mr. S. Hanley,—"On Solomon Island Ferns," by Mr. J. G. Baker,—and "The Fifteenth Contribution to the Mollusca of the Challenger Expedition," by the Rev. R. Boog Watson.

GEOLOGICAL SOCIETY.

June 21.—Mr. J. W. Hulke, President, in the chair.—Mr. R. B. N. Walker was elected a Fellow.—The following communications were read: "On *Thecospondylus Horneri*, a new Dinosaur from the Hastings Sand, indicated by the Sacrum and the Neural Canal of the Sacral Region," and "On the Dorsal Region of the Vertebral Column of a new Dinosaur, indicating a new Genus, Sphenosphondylus, from the Wealden of Brook, in the Isle of Wight, preserved in the Woodwardian Museum of the University of Cambridge," by Prof. H. G. Seeley.—"On Organic Remains from the Upper Permian Strata of Kargalinsk in Eastern Russia," by Mr. W. H. Twelvetrees,—"On the Rhætics of Nottinghamshire," by Mr. E. Wilson,—"On the Silurian and Cambrian Strata of the Baltic Provinces of Russia, as compared with those of Scandinavia and the British Islands," by Dr. F. Schmidt, communicated by Dr. H. Woodward,—"On Chilostomatous Bryozoa from Bairnsdale (Gippsland)," by Mr. A. W. Waters,—"On the Silurian Species of Glauconome, and a suggested Classification of the Palæozoic Polyzoa," by Mr. G. W. Shrubsole and Mr. G. R. Vine,—and "On the Cause of the Depression and Re-elevation of the Land during the Glacial Period," by Mr. T. F. Jamieson.—The Society adjourned until November.

ASIATIC SOCIETY.

July 3.—Sir Bartle Frere, President, in the chair.—Sir A. Eden, Mr. F. Mathews, and Mr. F. V. Dickens were elected Resident Members; and Samaldaan Kabi Raj and Mr. W. Rockhill Non-Resident Members.—Papers were read by Mr. W. Simpson "On Buddhist Caves in Afghanistan," and "On the Identification of a Sculptured Tope with Sanchi': also, by Mr. C. Gardner, "On Written and Unwritten Chinese Laws." At the close of this paper Sir R. Alcock remarked on its importance and expressed the hope that it would be speedily printed; and Mr. G. Bertin, referring to some of the views advocated by the writer pointed out how remarkable are the affinities between the Chinese laws and those of the Akkadians, which he has been recently studying on the clay tablets of Babylon. This view, he added, is not really surprising when we remember that Mr. T. de Lacouperie has been able to trace to Western Asia (as its origin) the first idea of much of Chinese culture.

ARISTOTELIAN SOCIETY.

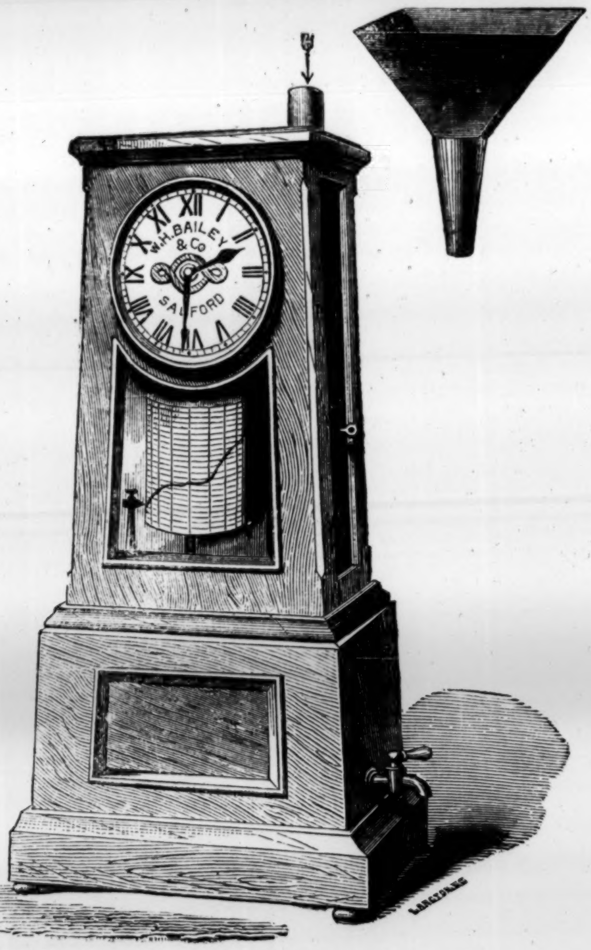
July 3.—Mr. S. H. Hodgson, President, in the chair.—The following gentlemen were re-elected officers of the Society: Mr. S. H. Hodgson, President; Mr. W. R. Dunstan, Dr. J. Burns-Gibson, and Rev. W. C. Barlow, Vice-Presidents; and Dr. A. Senier, Honorary Secretary.—A discussion then took place on "Subject and Object, and their Dependent Ideas—Ego, Self, Soul, and Mind."

A Locomotive Telegraph.—A system for enabling a railway train in motion to send and receive telegrams was recently tried on the Altanta to Charlotte ærial railway in America. It is the invention of Captain C. W. Williams, of the United States Army, and consists of a telegraph wire running along the track, but insulated from it, and interrupted at intervals of 40 feet. The ends at each break are connected to copper rollers which normally are in contact, so that the electric circit is completed through them. One car of the train is fitted up as a telegraph office, and two long metal strips or rails projecting from below the car rub against the metal rollers as the car passes. In doing so they depress the rollers, thus causing them to break contact with one another. The strips are connected together through the instruments in the car, and the electric current passes from one roller through the instruments to the other roller, and thence pursues its way along the rest of the wire. The circuit through the apparatus thus established is never absolutely interrupted, for as the car moves from one pair of rollers to the next, the strips make contact with the latter just before contact with the former is broken. The instruments, in fact, are constantly moving along the telegraph line as the train itself moves, and hence a message can be recorded on them or despatched. Telephones can be used as well as the ordinary Morse and Sounder instruments; and the system enables a passenger to send or receive an important telegram while travelling, or the position and state of the train to be communicated to a distant station.

NEW PLUVIOMETER.

The object of this instrument is to supersede the ordinary rain guage, which is troublesome in practice, as well as being incomplete in its registrations. Doubtless the total rainfall in a given time may be accurately obtained, but unless the observations are made at very short intervals, it is utterly impossible to tell at what portion of the time the varying amounts fell.

Self-registering pluviometers have frequently been designed to obviate this difficulty, but, so far as we are aware, they have not in many cases answered the expectations of their designers. The instrument, of which we illustrate the outward appearance, is internally composed of a cylindrical vase, in which is a peculiar float, having attached thereto an upright rod terminating in a delicate spring pencil or pointer. A drum, on which a suitably prepared diagram sheet is fixed, turns by means of a clock attachment, so that as water enters the vase a curved line is traced on the sheet, showing the height to which the water attains at any given time. The area of collection can be so proportioned, if required, that an inch of rainfall may be represented on the diagram by four or more inches of space; by which means great accuracy in the fractional parts can be obtained.



It will readily be perceived that the pluviometer is intended to be placed inside the observatory, and to be connected with the collector by means of a pipe. The constant and automatic registration thus obtainable should make an instrument of this kind indispensable to meteorological observers, water works authorities, and others. It is the invention of Mr. William Gadd, Civil and Consulting Engineer, Manchester, and is manufactured by Messrs. W. H. Bailey and Co., Albion Works, Salford.

Analyses of Waters from the Isthmus of Panama.—M. Aillaud states that the only remarkable feature in these waters is the presence of ruthenium in that of the Rio Grande.

THE AUGUST METEORS.

It seems to be admitted on all hands that there is a great falling off in the number of meteors in the Persied group this year. And this fact is rendered more certain from the exceptionally favourable circumstances under which the various observers have been placed; for, with few exceptions, we believe there was a clear and cloudless sky, the moon being absent. The display was greatest on the evenings of August 10-11 and 11-12, when the meteors emanating from the radiant point in Perseus, capable of being counted by a single observer, seem to have averaged about 26 or 27 per hour between the hours of 10 p.m. and 2 a.m.; whereas some years ago the average number under like condition has ranged from 40 to 80 per hour. It must not be inferred that the falling off is sudden, for, although the sky has been exceedingly unfavourable for these observations for two or three years past, nevertheless such observations as could be obtained seemed to clearly indicate a gradually decreasing number in the meteor shower each year. Now, this group of meteors is well known to be travelling round the sun, in some orbit as yet not clearly defined; and it is highly improbable that the group is equally distributed along the whole path of the orbit, or that the individual meteors are equal in size. On the contrary, it would appear quite probable, reasoning from analogy, that the component parts of this group, as well as others, tend to approach one another, forming at one part thereof a kind of aggregation or nucleus, thus rendering it possible that at some portion of the orbit, its number of meteors is exceedingly attenuated, even if it is not there entirely denuded.

If this view of the case is correct, it follows that the numbers will decrease every year until the minimum is reached, when there will be a corresponding increase to the maximum, or to the time when the earth will cut the path of the group during the passage of the greatest aggregation or nucleus of the system. This length of time will depend upon the amount of the aggregation, and the extent of the elongation of the ellipse of the orbit, and as it is very difficult to obtain an approximate calculation of the path of these boulders through space, we would suggest careful observation of the maximums and minimums, with accurate tabulation thereof, which would give the periodic time of revolution of the mass, at any rate roughly. If some means can then be obtained for determining their rate of motion through space, we think that, coupled with what is known on the subject, such as the fact of the path of the orbit crossing our own, and thus coming within the earth's distance of the sun, it will be possible, at least, to map out a few possible orbits for this group, which shall approximate pretty nearly to the truth.

THE GREAT PYRAMID.

As the subject of the Great Pyramid is exercising the minds of a weekly contemporary, just as it has previously been a difficulty for a very learned professor and the thinking world for ages, it may be interesting, and probably of some practical use, to reproduce Wallace's analysis of the mortar used in the building of this mysterious and ancient structure. As might be expected, Gypsum is found to be the main ingredient, and we give the composition as follows:—

Hydrated sulphate of lime	92·83
Carbonate of lime	4·63
Carbonate of magnesia	1·66
Alumina	0·24
Ferric oxide	trace
Silica	0·88
Hygroscopic water	0·07
	100·31

Whether any learned professor would be able to perceive in these numbers a supernaturally communicated knowledge, or whether our ingenious contemporary can find some astronomical analogy therein we know not; but we think it just possible that, with patience and perseverance, a theory might be raised, which at any rate would carry with it a certain amount of plausibility, provided there existed that peculiar form of faith which pre-supposes a special kind of mystery, or deep meaning, in anything which is sufficiently old.

A Miniature Railway.—There is now at work an interesting miniature railway—about five miles in length—which unites the village of Westerstede, in East Frisia, with the station of Ocholt, on the Oldenburg and Leer line. It is solely due to the enterprise of the thinly-scattered population of the district, and carries their cattle and other produce to market, bringing them back their few requirements. The soil is marshy, so that a good deal of drainage work had to be done, and it was necessary to carry the line above the level of the frequent floods. In spite of this, the cost of construction was only £2,103 7s. 6d. per mile; and the cost of working (including wages, fuel, and every expense) amounts to the magnificent total of £1 7s. 6d. per diem. The buildings consist of a shed at each end of the line; the terminus is the courtyard of the principal inn at Westerstede, and the single station—half-way along the line—is the house of a gentleman, who hospitably entertains the passengers while they are waiting for the train. The rolling-stock comprises two small four-wheeled tank locomotives, weighing (when in working order), 7½ tons each; three carriages, of the American type, with a door at each end; two open goods trucks and two covered. A train consists of the engine and two vehicles, between which the guard sits. There are no turn-tables, so that the locomotive is at the hinder end of the train in returning. The fuel employed is turf, which is abundant in the district.

STEAM TRAMWAYS IN LONDON.

The London Street Tramways Bill provides for the construction of a tramway along the Pentonville Road from the Angel, Islington. to King's Cross. This completing link was much wanted between the Great Northern and Midland Railways, and the system of tramways which branch from the Angel at Islington in various directions. Pentonville Road having a very steep gradient, it is proposed to drive the cars by means of stationary engines placed at several points on the line, on the principle which has been adopted in America, using wire ropes passing under the permanent way. Now, we distinctly think this method an objectionable portion of the scheme, as the nuisance which will arise from the stationary engines will be intolerable to the whole locality, not to mention the extra impediment in the roadway of a tram line so arranged. Altogether it is to be hoped that the authorities will reconsider this part of the plan, so as to respect the rights of the inhabitants of this locality; for, although we are desirous to see every possible extension of engineering works of a publicly useful character, it is desirable that such should we done in a more satisfactory manner to all concerned.

INCRUSTATION OF BOILERS.

Probably there is no evil connected with the use of steam power which has had so many nostrums propounded for its irradication as this troublesome one of incrustation of boilers; and yet it is a subject upon which there would appear to be as little real knowledge. where that knowledge is most needed, as one could very well conceive, taking into account the length of time steam boilers have been extensively in operation. The cause of this want of information is not far to seek, for the boiler doctors, like quacks in the medical world, have desired to find some universal remedy, capable of curing diseases arising from a diversity of causes.

The importance of the evil is best illustrated by citing a case. It is reported by Kolb, that a certain steam boiler at Amiens, when clean, evaporated 7·5 lbs. of water per pound of fuel, whereas when dirty or incrustated with scale, it only evaporated 6·4 lbs.; thus showing a loss of about 17 per cent of the fuel used. It is well known that rain water is unsuitable for use in steam boilers on account of its corrosive action upon iron plates, but few treatises point out the cause of this, which is chiefly due to the amount of free acid found in the rain water of towns. In some cases this amounts to nearly 4 grs. of free acid to one gallon of rain water. Even condensed water, obtained from steam coils, engines, or other sources, although containing very little mineral matter, may be surcharged with organic matter, which is doubtless often injurious to boiler plates. Generally our users of steam boilers depend upon the water supply of canals, wells, springs, or the town reservoirs. Where tairly pure water, or such as is substantially free from mineral matter, can be obtained, it is a cause for thankfulness; but this is very often not the case. It therefore behoves all whose boilers suffer from incrustation to ascertain, with analytical precision, the peculiarities of both the water in use, and the scale formed, so as to obtain data for reducing the loss from this cause to a minimum.

Boiler incrustations will be generally found to consist of sulphate of lime, with smaller quantities of other substances; but in some cases the scale may be due to carbonate of lime. When the latter, however, exists, it is most probably caused by the use of caustic soda, as the predominating constituent in virgin scales is usually sulphate of lime. The mud taken from the bottoms of boilers has been found to consist of a mixture of the carbonates of lime and magnesia, silica, alumina, and iron oxide, with a small quantity of organic matter, but with very little sulphate of lime.

Although condensed water materially alters the character of the scale, it does not do away with this disease affecting steam boilers; indeed, it is possible that this kind of scale is more injurious than the ordinary scale containing sulphate of lime.

Two analyses of boiler deposit are given below, where condensed water was used, which show the necessity of great care in investigating the character of these waters.

Water	2·831
Fatty matter	1·430
Organic matter	21·995
Silica	21·713
Sulphuric acid	6·947
Chlorine	0·139
Oxide of iron	3·836
Phosphoric acid and alumina	7·878
Lime	15·752
Magnesia	4·151
Sand and clay	12·283

Water	3·00
Silica	6·05
Magnesia	3·67
Oxide of copper	11·90
Oxide of iron	7·50
Lime	20·25
Alumina	2·25
Carbonic acid	14·10
Organic matter	27·68
Sulphuric acid and chlorine	traces

These two instances are doubtless very unusual scales, but they show what complicated deposits sometimes occur with condensed waters.

The following two analyses of scales are given to represent widely varied results, obtained from the use of town water, in one instance, and well water in the other:—

Calcium sulphate	79·56
Carbonate of lime	5·05
Ferric oxide	1·53
Alumina	1·02
Magnesia	5·34
Water and organic matter	7·75
Phosphoric acid and alkalies	traces

Sulphate of lime	37·06
Ferric oxide	38·98
Alumina	1·62
Organic matter and water	8·80
Magnesia	10·36
Carbonic acid	2·58
Metallic iron and alkalies	traces

Numerous analyses could be given which have been published from time to time, showing that every different source of water produces its own particular kind of scale, and consequently will probably require different treatment to insure its reduction to a minimum. This is so obvious that one would have thought that the first act of the owner of steam boilers would be to obtain a careful analysis of the water he is compelled to use, and to take the advice of a scientific chemist as to the particular nature of the precautions to be adopted, always supposing he has not the requisite chemical knowledge to do this for himself. But do we find this the case? On the contrary, the experience of the past teaches us that the owners of these valuable generators rather take up some quack remedy, which may be placed before them by some ignorant charlatan who has a great capacity for pushing his wares.

Some boilers, and not a few, have been completely ruined by these unwise and unthinking experiments, to the irretrievable loss of the proprietors. The sums often paid for these nostrums are really enormous. In one case, a man was selling a mixture of fuller's earth and sal-ammoniac for £30 per ton. Another supplied two fluids at a high price for this purpose, the one being vitriol, and the other a solution of common salt. There is very little doubt that the latter mixture would fetch off the scale, and do something else besides.

It has been proposed at various times to adopt the following means for preventing the formation of scale:—

1. Apparatus introduced inside the boiler.
2. Iron borings, zinc plates, carbon blocks, &c.
3. Electricity.
4. Fuller's earth, &c.
5. Fatty matters.
6. Tannic acid and substances containing same.
7. Starchy matters, sugar, glycerine, &c.
8. Precipitations in the boiler.
9. Frequent blowing off.
10. Hydrochloric acid, acetic acid.
11. Sal-ammoniac.
12. Barium chloride.
13. Heating the feed-water.
14. Carbonate of soda, caustic soda.
15. Tribasic phosphate of soda, or "Tripsa."

With a host of other remedies.

The last-named, in conjunction with frequent blowing off, may be found useful in cases where the scale is largely composed of sulphate of lime, as it has the property of absorbing the free carbonic acid in the water, and where sulphate of lime is present forms phosphate of lime and sulphate of soda.

De Haen and others have proposed to purify the water before it is allowed to enter the boiler; and doubtless, if this could be done at a very low cost, it would be by far the best; but, so far as we are aware, the various processes for this purpose are so costly that boiler proprietors fall back upon cleaning away the scale as it accumulates.

In conclusion, our advice to all concerned is to have a complete analysis of the scale and water made by a competent professional man, and he will, we believe, in the majority of instances be able to prescribe such means as will reduce the evil to its lowest point.

Silkworm Culture in Hungary.—Encouraged by the results of the last three years, the Hungarians intend to devote even more attention than they have hitherto done to the culture of silkworms, a branch of industry which the Californians are taking up. From a report which has just been issued, it appears that in 1880 the communes where silkworm breeding was regularly carried on numbered only 109, and the persons engaged in the production of silk only 1,059, whereas last year the number of communes had increased to 426. and that of the producers to nearly 3,000. The produce in the first of the two years did not exceed 20,000 lbs. of cocoons, whereas in 1881 it was about 83 000 lbs. The silk produced in 1881 was sold for 63,000 florins, and thus a profit was made which supplied the Government with the means necessary for the establishment of a model school for the purpose of still further promoting silk culture. It has also been arranged that a number of village schoolmasters shall be instructed at the model school in order that when they return to the villages they may be able to show the inhabitants how to carry on this branch of industry. The Government has, moreover, defrayed the cost of nearly 30,000 mulberry trees, which it is found grow well in most parts of Hungary. It has also been suggested that mulberry trees should be planted along the public roads and open spaces which belong to the municipal authorities. The rising generation would, perhaps, purloin the fruit, but would not meddle with the leaves, which are the most valuable part.

Mr. Brooks French, of Fort Wayne, Ind., has patented a simple, easy-working, and effective *stop action*, by which there may be obtained a greater number and variety of stops with one stop drawer; also, to regulate and control the opening of the mutes by simple devices.

BRITISH